plants represent the ultimate solution. Experts at Lilly and elsewhere say they may go the way of heart and kidney transplants. As major surgery, islet transplants may be performed infrequently. However, the patient may opt for the transplant if it can halt the chronic complications of diabetes.

Perhaps the biggest question facing the insulin market in the immediate future is whether Lilly's recombinant DNA insulin will pan out. With Novo and Nordisk trying to grab part of the U.S. market, recombinant DNA insulin may be Lilly's saving grace. Bacterially made insulin may not only protect Lilly's share of the domestic market but also prove to be a product suitable for aggressive marketing in Europe. As Johnson of Lilly says, "The company has been the leader in insulin for decades. It was the first to produce insulin by recombinant DNA and it will be the first to bring it to market."

Lilly, however, may find that the pumps will change the face of the insulin market and see its dominance slip away. Within the next decade, Lilly's sales team, for the first time, may have to leave calling cards along with Novo and Nordisk. Whatever kind of shake-out occurs in the marketplace, diabetic patients will soon have a wider choice of drugs and therapies. The patient is thus one certain victor in the coming insulin wars.

—Marjorie Sun

NRC Plans to Deregulate Biomedical Waste

Medical researchers may benefit; other producers of radioactive trash may be hit with higher costs

Few have the power to solve a problem by declaring it nonexistent, but that is what the Nuclear Regulatory Commission (NRC) hopes to do by proposing a new rule for the handling of radioactive biomedical waste. The problem is that no jurisdiction wants to accept garbage that the NRC has tagged as radioactive. For this reason, some laboratories are having trouble cleaning out their accumulated backlog. The NRC's solution is to remove the radioactive classification and hope that this will make it easier to dispose of the material.

The new rule, which could go into effect early next year if adopted by the Commission, would exempt certain kinds of biomedical waste from NRC regulations. The change could reduce by half the volume of low-level radioactive trash that must be shipped to federally approved burial sites. Many users of the sites will want to stop shipments if the rule is approved. One effect of the decline in traffic could be that fees may be doubled for those who cannot take advantage of the exemption. The cost of maintaining the sites will remain high, and dump operators may make up for lost business by charging the remaining clients more. The high cost of shipping the material ($250 a barrel from New York to the West Coast) will force laboratories and hospitals to find local solutions.

The NRC's proposal is simple; it would treat radioactive research materials in a couple of categories as though they were not radioactive at all. The categories to be exempted are animal carcasses and "scintillation media," the latter being most often a toluene-based organic solvent. In order to qualify, these wastes must contain only the standardized "tracer amounts" of hydrogen-3 or carbon-14, defined as less than 0.05 microcuries per gram.

If this rule change is approved, many large universities in the Northeast—where there are no waste burial sites now—will be able to reduce the amount of garbage they ship west for burial. Harvard and Columbia, for example, both send their low-level radioactive trash 3000 miles away to the only site that will accept it, in Washington State. This site, like the only other two in operation, one in South Carolina and one in Nevada, is scheduled to reduce the amount of material accepted from out of state. The NRC rule change would cut back on these interstate shipments, for it would encourage local disposal by such methods as incineration. The NRC estimates that the interstate traffic in scintillation wastes could be reduced by 200,000 to 400,000 gallons a year.

In addition, the NRC proposes to allow research laboratories to pour more radioactive material down the drain into the sewers. Each licensee is now permitted to dispose of some liquids this way, provided that the liquid is water-soluble and carries no more than 1 curie of radiation out of the laboratory each year. The new rule would raise the limit from 1 to 7 curies per year, allocated as follows: 1 curie for undefined waste, 1 curie for carbon-14, and 5 curies for hydrogen-3. There would be no limit on sewer flushing of excreta from people undergoing medical diagnosis or therapy with radioactive material.

The proposal has attracted little attention, but those in biomedicine who know about it seem generally pleased. Radiation safety officials at several universities with large research facilities told *Science* that they were glad to see the NRC become more tolerant, but they wished the agency had gone further. Some suggested that certain radioactive isotopes of calcium, phosphorus, sulfur, and iodine should have been included in the general exemption. Some wanted the NRC to exempt laboratory gloves and wastepaper as well. Although the preponderance of comments received by the NRC favored the change, or regarded it as a "good first step," there was also some strong dissent.

> The categories to be exempted are animal carcasses and "scintillation media" . . .

Ralf Rahwan, an associate professor of toxicology at Ohio State University, wrote the NRC to protest the change. He argues that there is no evidence to support the agency's assumption that no harm will be done by releasing additional small amounts of radiation into the atmosphere and the sewers. "If they can provide figures showing that there is an increased risk that only 100 people a year will be affected then I think it would be

0036-8075/80/1212-1228$00.50/0

all right," Rahwan says. "But if there is an increased risk for 10,000 people a year, then it would be unacceptable." Rahwan says a decision to relax the standards will be taken as a signal that sloppiness in handling toxic chemicals will be tolerated. "If anything, we should be tightening the standards," he concludes.

Although not many people are worried about radioactive pollution, quite a few are concerned about the toxic chemicals involved. The most commonly used scintillation liquid, toluene, is flammable, immiscible in water, and suspected of being a carcinogen. Some fear that if the NRC ceases to demand that this chemical be collected and carefully handled, laboratory workers may be inclined to pour it down the drain, even though this is forbidden by other hazardous waste regulations.

Joseph Rosenberg, the president of a waste-handling firm in Massachusetts called Interex, worries about the side effects of the NRC's proposed rule. The new proposal, he thinks, is "cavalier." It is like "clearing your driveway by shoveling the snow onto the next guy's driveway." About 20 to 30 local water systems in Massachusetts have been contaminated by chemicals, he says. Relaxing the NRC's standards will send the wrong signal and make it more difficult to control the kind of chemical pollution found in his state. If the NRC fails to grapple with the mess, some other agency will have to do the job.

Philip Lorio, Columbia's radiation safety officer, welcomes the NRC's proposed change as a "very intelligent move." According to Lorio and several others, the safest and most sensible solution would be to burn low-level radioactive wastes in specially designated incinerators. This approach would disperse the radioactivity and destroy the chemicals at the same time. But Lorio thinks the public is just too "paranoid" about radiation to permit it.

—ELIOT MARSHALL

The Case of the Unmentioned Malignancy

Radiobiologists are under fire from cell researchers for not reporting suspected cell contamination

That even a minuscule amount of radiation can cause cancer, genetic damage, and cell death has long been suspected by one school of biologists. In 1979, Paul Todd and Paul S. Furcinitti of Pennsylvania State University published a report in *Science* (26 October, page 475) that added new evidence to back up this belief. They took human kidney cells, exposed them to gamma radiation, and calculated that cell death occurred even at minute doses. The results were widely reported, as they were a pioneering effort in the low-dose area and they clearly contradicted the competing theory that holds no damage occurs below a certain radiation threshold. "Low radiation doses do cause cancer," read the headline in a *New Scientist* report on the research.

There was just one problem. It turned out that the cells were not normal but malignant—a fact that has subsequently cast a cloud over the whole experiment and raised a chorus of accusations and retorts concerning scientific credibility and candor.

The experimental ambiguity is significant in itself, for the results originally had application to both radiation therapy and the setting of radiation standards. In addition, the incident appears to be just one of a rash around the world in which the same "normal" cells used by the Penn State researchers were inadvertently used to explore the biological effects of radiation. One upshot of this will undoubtedly be a concerted attempt at stricter verification of cell line authenticity and possibly more explicit references in routine scientific reports about these problems.

Also significant is the fact that the Penn State researchers for more than 3 years after being alerted to the possibility that theirs was a malignant cell line took no action to pin this possibility down. Defending themselves today, these researchers say that the change in cells makes no difference in the outcome of the experiment. Even so, they tried in the past to alert the scientific community to the problem, but some journal editors, apparently feeling that such research already had enough interpretational latitude, had the Penn State researchers clean up their manuscripts, removing speculations about the malignant origins of the cells.

The troublesome cells suspected of infiltrating normal cell lines are those of Henrietta Lack, a 31-year-old black woman whose cells were isolated in 1951 when researchers from Johns Hopkins University succeeded in making cells from her uterine cervix grow in laboratory dishes. Though Lack later died of cervical cancer, her cancerous cells achieved immortality and were dubbed HeLa, after the first two letters of her first and last name.

First public disclosure of the probable HeLa origin of the Penn State researchers' cell line came from Walter Nelson-Rees, a cytogeneticist at the University of California Naval Biosciences Laboratory in Oakland who, after reading the Penn State report in *Science*, suspected that the cells were not normal. Publishing his findings in *Science* (8 August 1980, page 719), he reported not only that the Penn State cells, supposedly normal kidney cells known as T-1, were most likely descendants of HeLa cells, but that four other samples of T-1 cells from around the world, including those from the laboratory of J. van der Veen, who originally isolated the cell line, showed the same indications. Nelson-Rees noted that HeLa cells were present when T-1 cells were originally isolated from an 8-year-old Dutch boy in 1957. Apparently the T-1 cells were contaminated by the HeLa strain, and ever since, all T-1 cells have in reality been HeLa descendants.

In fact, Todd and the researchers at Penn State first got wind of this probable state of affairs back in March 1977 when the American Type Culture Collection (ATCC) outside of Washington, D.C., notified them that the T-1 cells they tried to deposit were probably HeLa descendants. This fact was not mentioned in their subsequent published research, nor did they try further to track down the cell lineage—a job left to Nelson-Rees more than 3 years later. "We felt that the ATCC evidence was skimpy," says Todd. "Besides, we were in the business of radiobiology, not the cytogenetics

0036-8075/80/1212-1229$00.50/0