barrel a day of production, conventional oil fields in Alberta have become just as expensive as the oil sand areas because the cost of acquiring land is climbing rapidly and successful wells are being drilled with declining frequency. A paper delivered at the conference by two geologists for British Petroleum (BP), Roger Mowll and J. K. Hambling, pointed out that heavy oils recovered in situ "may be capable of yielding crude at a cost little different from the more expensive sources of conventional crude." BP's northernmost North Sea Field, Magnus, was developed at a cost of something over $2.5 billion (U.S.), they wrote. It is now producing about 100,000 barrels a day and will gradually decline until its estimated recoverable reserves of 400 million barrels have been depleted. Syncrude, which cost about the same amount, is expected to produce at least 100,000 barrels a day for its entire 25-year lifetime, for a total of nearly 1 billion barrels.

With an incentive like that, why isn't there a stampede into the heavy oil fields? There is a slow-motion stampede of sorts in Alberta, where the landscape and the economic climate are hospitable. The action is less dramatic in the United States for several reasons. First, there are environmental limits. Oil reclamation projects consume and foul huge quantities of water. Imperial's Cold Lake will probably need five barrels of fresh water for every barrel of oil produced. They also release sulfur gas and other chemicals (60 tons of SO_2 a day is the projection for Cold Lake). Alberta can afford to be more generous with its air and water than can California, where much of the American heavy oil is. Second, company officials say that American heavy oil fields often fall into the category of "old oil," meaning that their output is controlled at prices lower than market level, making them unattractive for investors. Third, reclaiming oil with heat requires sophisticated tactics designed specifically for the reservoir in question. Imperial claims to have spent 15 years and $30 million preparing for the commercial project at Cold Lake. The cost amounts to $100 million, Peterson said, if all the experiments and engineering projects associated with that field over the years are counted. Projects in warmer, more familiar fields may not require so much research, but they will require costly, individually tailored development plans.

According to Fred Hallmark, reservoir engineer for the California Division of Oil and Gas, his state produces right now about 500,000 barrels of heavy crude oil daily, half of it by steam or other thermal recovery techniques. He estimates that in California alone there are between 1.8 billion and 3 billion barrels of "unconventional" oil in place, a reasonable fraction of which could be recovered with methods such as those being proposed in Alberta. Claude Hocott, an oil consultant from Houston, Texas, said that if the price of oil were to climb to $25 a barrel in the United States, the estimated crude oil reserves of California, Louisiana, and Texas would increase by about 7 billion barrels.

The world market price for light crude oil is now around $15 a barrel, with batches on the spot market selling for $25 and higher. The OPEC members are telling reporters that they want to raise the official OPEC price to $20 a barrel this summer. If the United States were to lift its domestic price controls now, there is no question but that many of the neglected heavy oil fields would be brought into production.—ELIOT MARSHALL

NCI Bioassays Yield a Trail of Blunders

Costly tests of suspected carcinogens have been dogged by negligence and mismanagement

Early last month, the National Cancer Institute (NCI) startled the general public with reports that four chemicals in commonly used products cause cancer in laboratory animals. The reports* were the most recent harvest of the NCI bioassay program, an expensive, federally supported system of testing suspected carcinogens. Frequently, regulatory officials seize the results of the bioassays and go charging into the *Federal Register* with proposals to remove products from the market. They do so with confidence because NCI has represented the tests as ranking with the best performed anywhere in the world.

Lately, it seems either that this representation is an exaggeration, or that an awful lot of poor testing is going on elsewhere. Provoked by a recent NCI disclosure that 51 long-term bioassays are so deficient they cannot be written up in technical reports, outside observers are beginning to question the reliability of the entire program. Federal investigators checking into the work performed for the NCI program under contract have discovered that much of it has been casual and haphazard, and that some of it has been unusual. Audits covering each of NCI's prime contractors for the bioassays indicate that the contracts were awarded under irregular circumstances and that the contractors have been receiving more compensation than merited by their performance. NCI itself has consistently failed to detect or correct the program's failing, three reports suggest. As a result, there is a move afoot to pluck the bioassay program from beneath NCI's wing and transfer it wholly to another federal science agency.

The bioassay program has been controversial since its inception in 1971. Congress envisioned it then as the best means to determine which of the 10,000 important chemicals in commercial use posed a hazard to human beings. The plan, which fell to NCI over its strong objections, was to test suspected chemicals in carefully selected rats and mice, typically over the lifetime of the animals. NCI objected because the tests are lengthy, expensive, and tedious. But they are also the only systematic large-scale measurements of the hazards of existing chemicals, particularly those about which suspicions have already been raised. (The Toxic Substances Control Act, enacted in 1976, mandates testing only for newly invented chemicals.) The hazards of Tris, Kepone, DBCP (dibromochloropropane), chlor-

*On reserpine, an antihypertension medication; methapyrilene, an antihistamine also used in nonprescription sleep aids; selenium sulfide, used in dandruff shampoos; and disulfiram, both a fungicide and an anti-alcoholism medication.

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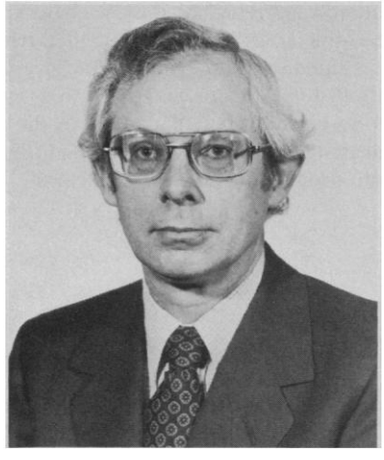
Congress Says Bioassay Reports Are Stalled

The most embarrassing charge that Congress has leveled against the National Cancer Institute (NCI) bioassay program is that NCI has frequently shelved valuable test results and delayed for years before publicly releasing bioassay findings. According to the latest congressional reports, for example, NCI is now sitting on the results of 223 studies completed before 1977, a charge that NCI strongly denies.

The charge carries with it the dark implications of a cover-up, and this is why it has embarrassed NCI. The agency has faced the charge before. In 1976, a series of congressional hearings uncovered a backlog of 207 unwritten technical reports, and NCI was ordered to publish them all by September 1978. Now, just as NCI is finishing up the last of those reports, the General Accounting Office (GAO) has raised new charges about another backlog. Representative Henry Waxman (D-Calif.), who requested the GAO report, has flatly accused NCI of misleading Congress about the total number of tests it had not reported. "We now know that the results of hundreds of completed tests are languishing in NCI files," Waxman says. "Another 'Tris' may well be lurking."



Richard Griesemer

NCI officials, realizing it sounds like a deliberate suppression, deeply resent Waxman's statement. Richard Griesemer, who has directed NCI's bioassay program since 1977, is not exactly contrite. "There isn't any backlog now and there never has been," he insists. He says even the so-called initial backlog of 207 reports was a misnomer. "The commercial laboratories had no contractual requirement to write technical reports," he says, and thus no backlog occurred when they didn't. He acknowledges, however, that it would have been common sense for the contracts to spell out such a requirement.

Griesemer also says that draft copies of those 207 reports were consistently prepared on deadline and sent to various regulators. Congress says that 23 of the 207 studies have never received final NCI clearance and that no regulator ever takes action on tentative data. As Representative Albert Gore (D-Tenn.) told NCI officials in 1978, sending out draft reports puts regulators "in a position where there is the bureaucratic disease of passing the buck and waiting until all the ducks are in a row. You can talk all you want to about the significance of having completed drafts. . . . But the fact is that you did not meet your goals. The fact is that the importance of meeting those goals cannot be overstated."

As for the second, newly discovered backlog of 223 as-yet-unreported studies, Griesemer says that most were conducted for research and not to determine whether a specific chemical is carcinogenic. "Almost all of our contractors were expected to publish their results in the scientific literature, and they did." Experiments on 155 chemicals in the secondary backlog resulted in 96 publications in the literature, he notes.

Other scientists familiar with the bioassay program agree that at least 37 of the 223 unpublished studies were never intended to be reported as technical carcinogen screenings. These were conducted intramurally by NCI staff in 1971 and 1972, at a time when NCI was primarily interested in establishing appropriate animal testing protocols and learning about cancer mechanisms.

The other studies in the secondary backlog were performed at the Frederick Cancer Research Center and at the University of Nebraska's Eppley Institute for Research in Cancer. For these, Griesemer's claim seems less valid. Formal testing protocols were written for the 19 tests conducted at Frederick, for example, and March 1978 is listed in NCI documents as an expected reporting date. The 167 studies conducted at Eppley are less clear-cut because few were performed under standard test protocols. In part, they were intended as research, and in part, former Eppley director Philippe Shubik simply resisted following NCI's guidelines, according to several sources. Many of the Eppley studies, according to the GAO, were approved orally by NCI officials, and few progress reports were sent. (Eppley spokesmen did not return phone calls for comment.) At the time of the GAO report, the Eppley work had resulted in 115 publications in the literature, but NCI was "embarrassingly unfamiliar" with them, according to an NCI employee. Many of the studies were published in European journals.

Umberto Saffiotti, who directed the bioassay program during the years that most of the Eppley projects were begun, says that "technical reports on the studies could always have been prepared—the question is, was it worth the effort? For some of the research studies, it clearly was not, either because a standard protocol was not followed, because the number of animals used was too small, or because the animals were sacrificed too early. We did envisage technical reports for some studies beyond the standard ones, however, and in general the information from these studies could be reported in a lot more detail than it is now." As for the adequacy of publication in the scientific literature instead of an NCI report, Saffiotti says, "The literature rarely gives the details valuable for regulatory activity, because they are cumbersome. This was, after all, the main reason for setting up the technical report series."

GAO's latest charges would appear, then, to be at least partly accurate. Some important details of numerous studies on chemicals used in insecticides, drugs, food, and manufacturing remain in NCI files. And NCI, apparently, has little enthusiasm about ferreting them out.—R.J.S.

dane, and heptachlor were in large part confirmed by the NCI testing program.

Since 1972, when the NCI actually began to write contracts for the testing, the controversy has gradually shifted from whether the NCI should be managing them to the way it was managing them. Now NCI's 1980 budget is before Congress, and the House and Senate appropriations subcommittees that must approve it are the recent recipients of severely critical reports on two of NCI's prime contractors under the bioassay program, Tracor-Jitco Inc. of Rockville, Maryland, and Litton Bionetics, Inc., which manages the huge Frederick [Maryland] Cancer Research Center. The third prime contractor for the program, the Eppley Institute for Research in Cancer at the University of Nebraska, was criticized in reports last year by the congressional General Accounting Office (GAO) and the inspector general of the Department of Health, Education and Welfare (HEW).

The latest report written by the GAO says that Tracor-Jitco failed to detect or report serious deficiencies in the bioassays performed under subcontracts. NCI failed to penalize Tracor-Jitco seriously for this lapse and also declined to let other firms bid for Tracor-Jitco's contract management job. The other report, which resulted from a 1-year investigation by the House appropriations investigative staff, is a little-noticed but far more scathing assessment of the Frederick center. The center's manager, Litton Bionetics, "has had an abysmal track record in management of the animal colony, in its chemical bioassay projects, and in its employee safety program," the report says. It also notes that the bioassays were characterized by numerous calamities and errors, and by excessive costs and low production. "If in fact the bioassays turn out to be of high quality," the reports says, "it will be attributable partly to luck and not to the efficiency of Litton management."

In recent hearings, the chairman of the relevant appropriations subcommittees have called NCI director Arthur Upton on the carpet for the problems and hinted that NCI's budget may suffer as a result. "This is a right important matter," noted Representative William Natcher (D-Ky.), the House chairman. His Senate counterpart, Warren Magnuson (D-Wash.) has ordered Upton to look into it. During a break in the hearings, Upton said he felt as if he were being "marched up to the scaffold."

Additional criticism has come from Representative Henry Waxman (D-Calif.), chairman of the House subcommittee on health and the man who had requested the GAO report on Tracor-Jitco. He called it "a serious indictment of management practices at NCI. The report reflects poorly on the Institute's commitment to quality research in cancer prevention." Responding to the disclosure that 51 bioassays are too deficient to be reported, Waxman says, "Waste of this magnitude diverts limited biomedical research dollars from other vital areas. In this instance, deficient management was directly responsible." Also, HEW Secretary Joseph Califano has requested that Upton explain the recent charges, and the HEW inspector general has promised a new investigation into the bioassay program's prime contractors.

"If in fact the bioassays [at Frederick] turn out to be of high quality," a congressional report says, "it will be attributable partly to luck and not to the efficiency of Litton's management."

In fairness, it should be noted that Upton is bearing the brunt of the current wrath mostly because he is the only NCI director immediately at hand; everyone agrees that the bioassay problems took root long before he arrived in 1977. Though his predecessors were apparently ambivalent about the program's fate, Upton has taken a decidedly different tack by pledging to upgrade it and by opting to resist attempts to wrest the program away from NCI and turn it over to the National Institute of Environmental Health Sciences (NIEHS). Given Upton's willingness to implement changes, it can safely be stated that NCI is running the program better now than it ever has.

It can also be stated, however, given the long history of criticisms of the program, as well as a certain reluctance on the part of NCI to reform it without congressional prodding, that the bioassays represent almost a textbook case of poor bureaucratic control. An unusual amount of negligence and poor judgment has dogged the program for some time. It has not been without success, of course: its research branch, for example, is credited with developing, in the early 1970's, animal testing protocols that now are standard throughout the business. Technical reports have recorded the results of 165 bioassays, and more await final NCI clearance. More than 100 compounds have been discovered to be carcinogenic in animals.

But the promise of the bioassay program was that far more chemicals would be tested in far less time at far less expense. Researchers estimate that 8000 widely used chemicals remain unscreened for carcinogenicity. Working against this backlog, NCI has committed $91 million since 1972, with annual expenditures rising from $8 million to a proposed $30.5 million in 1980. Congress and NCI have engaged in a lengthy and often colorful debate over exactly how much work has been performed (see box), but everyone agrees that perform-

ance has fallen short of expectations. At the Frederick center alone, for example, the NCI contract with Litton initially called for tests of 50 chemicals within 2 years; later the contract was revised to demand tests on 45 chemicals in 5 years. Actual output covered 28 chemicals in 6 years, and seven technical reports on the 21 completed to date have yet to be written.

Part of the gap between promise and performance can be chalked up to estimation inflation, a frequent occurrence under the scrutiny of congressional appropriations committees. But NCI's bioassay program has been afflicted with two diseases more profound than false optimism, diseases often found in bureaucracies whose missions are among the newly chic. The first is the disease of sudden wealth, precipitated by congressional boosterism that in recent years has given all of NCI as much as $60 million more than its requested budget each time the plate was passed. (NCI is the wealthiest scientific agency in HEW.) Until recently, the money was not matched with congressional permission to hire the people who could watch it closely. Reportedly, the program was staffed by one person during a period when it was getting nearly $10 million annually in funds. "We wanted to get away with doing it without additional space or staff," says Umberto Saffiotti, who resigned as director of the program in 1976 to protest the shortage (*Science*, 7 May 1976).

The second affliction at NCI has been neglect—a lack of strong commitment to the bioassay program, manifested mostly in the agency's reluctance to divert other resources so as to remedy the understaffing. (The bioassays account for roughly 2 percent of NCI's budget and, until recently, less than 1 percent of NCI's personnel.) As one federal investigator put it, "NCI doesn't believe this cookbook science stuff is their mission"—better they should write the recipes, and leave research unsullied by focused regulatory tasks. Benno Schmidt, the chairman of the President's Cancer Panel, is on record as favoring chemical testing by industry, not NCI, and members of other NCI advisory groups have said the same thing. To some extent, the attitude persists even among NCI staff. Richard Griesemer, a veterinary pathologist who currently directs the bioassay program, says that "although someone in government must do this work, I would like to see the research somewhat separated from the regulatory activities. NCI could be studying tumor promoters, chemical synergism, and the natural formation of hazardous chemicals in the workplace"—all research tasks.

As the result of NCI's lack of commitment, and the imbalance of money and staff, agency officials decided to hire outside contractors to supervise most of the bioassay work. The scheme had the attribute of keeping NCI within federally imposed personnel ceilings but enabled the money to be spent just the same. The tactic is a common one within HEW, but it has been widely criticized. Guy Newell, an NCI deputy director who has had a large influence on the bioassay program, strongly recommended the outside contracting. "I feel these tests can be done without direct control by active scientists," he said in 1976. "I believe that you can go out and buy expertise and you can get good expertise."

Gaps underneath doors permitted test animals to roam from room to room at the Frederick center.

One of the largest beneficiaries of the plan has been Litton Bionetics. Overall, the company has received more than $85 million in NCI funds since 1972, and recently signed a 5-year contract for an additional $140 million. Most of the funds are for Litton's management of the Frederick Cancer Research Center, at which a great deal of basic research is performed; bioassays account for only a small portion of the budget. Litton's initial contract for the Frederick center was awarded for 1 year after a competition in which five companies took part. Thereafter, the contract was renewed four times, and modified 53 times, without additional competition. When the new, long-term contract was offered in 1977, Litton was the only bidder—largely because "NCI did not offer a competitive environment," according to congressional investigators. "The 1972 contract represented the foot in the door. By 1977, Litton Bionetics was in the catbird seat." NCI denies any irregularities.

Litton's performance under its NCI contracts has not been great. Some of the problems follow:

At the Frederick Cancer Research Center in 1975, four bioassays were terminated when the test animals became infested with pinworms, resulting in a delay of 6 months while the testing facilities were decontaminated. The outbreak was attributed to gaps underneath doors in the testing facility that permitted animals inadvertently dropped on the floor to roam from room to room. A similar outbreak at a later time was attributed to the placement of a room for quarantine of newly purchased animals atop a room where testing was under way. Litton apparently placed the quarantine facility there in violation of NCI orders, and NCI staff called it "grossly irresponsible."

Also at Frederick, bioassays of nine chemicals were delayed up to 6 months after an outbreak of *Salmonella* infection among the test animals in September 1977. The incident led to the destruction of 51,000 carefully nurtured mice and rats. Similarly, an outbreak of mouse hepatitis scrubbed a test of the chemical Telone that was one-third completed. Other outbreaks of Sendai virus, *Pseudomonas*, and assorted viral infections forced Litton to kill 89,394 animals in all, at a cost of more than $320,000. Not all of the animals were being used in tests, but the effect of killing them was to delay the federal testing program because the Frederick center was the government's major supplier. The problems became so bad that Griesemer told Litton in August 1977 that NCI would no longer accept animals from Frederick, and the agency was forced to go to commercial suppliers instead; 6 months later, Frederick was reinstated.

Although a certain amount of animal infection is to be expected, the frequency of the outbreaks can be attributed in part to sloppy handling. Reviewing the record, for example, investigators for the House appropriations committee concluded that Litton "has muddled along from catastrophe to catastrophe in the animal colony." When NCI replaced its contract monitor in 1977, the new monitor described the breeding facility conditions as "appalling." In a 1976 test of animal handling procedures at Frederick, a chemical tracer was added to 1 day's feed supplied to a single group of animals. A week later, the tracer was detected on the walls and floors of the experimental room, in corridors, and on clothing and equipment. Also, after the *Salmonella* outbreak in 1977, Ronald Defelice, an NCI contracting officer, wrote a memo in which he pledged that "I am obligated to initiate an immediate investigation into this matter on the grounds that the animal 'destruction' is the fault of, or due to, the negligence of

the Contractor"—namely Litton. Curiously, this memo was later rewritten and toned down, and the original was removed from NCI files. NCI says this was not a cover-up and occurred because "the contracting officer only pointed out to the assistant project officer the seriousness and consequences of statements that had been made in the referenced memo."

Litton Bionetics has another arrangement with NCI to conduct bioassays under subcontract to Tracor-Jitco, which is itself an NCI prime contractor. These bioassays are conducted at Litton's laboratory in Rockville, Maryland, and—formerly—in Falls Church, Virginia. Specially trained investigators for the GAO visited the Falls Church lab and found "holes and cracks in the ceilings, walls, and floors" and "inadequate air exchanges and lighting." Quarantined animals had been placed in the same room with those being tested, and more than one chemical had been tested in a single room; these are not common practices elsewhere. Litton in its response said it did not test multiple compounds in a single room for its other clients, but that it did for the federal government "as a result of contract conditions." Since it was awarded the bioassay contract, Litton says, it has spent $50,000 on improving the Falls Church facility. In December 1977, NCI decided that the improvements were insufficient and ordered Litton not to begin any new tests there.

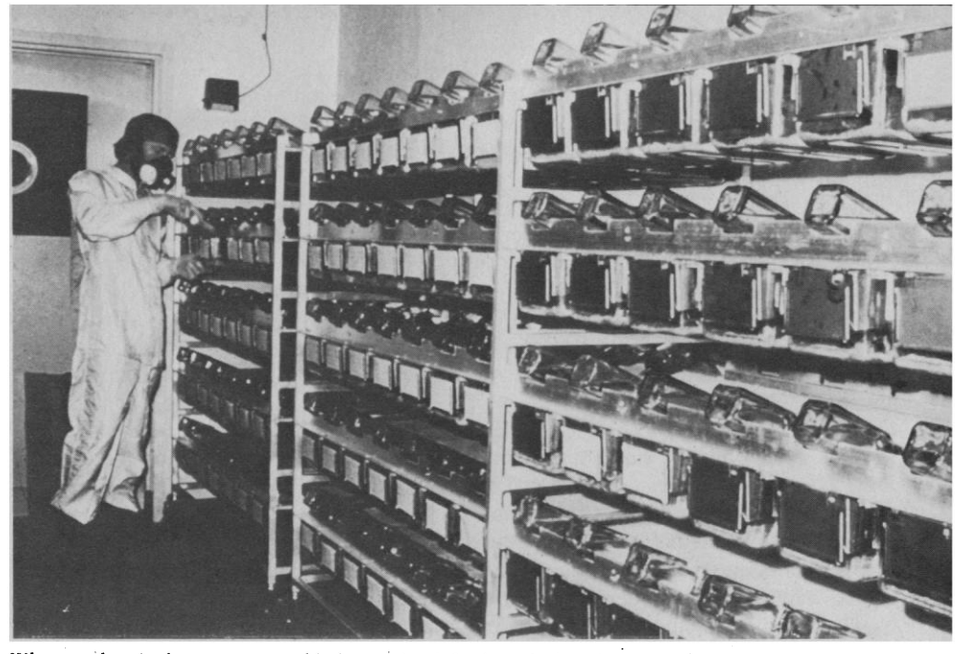
The GAO has criticized Tracor-Jitco for failing to detect many of these deficiencies, or to report them to NCI. The firm, which is headquartered in a Rockville, Maryland, shopping center, employs 35 people to keep an eye on its 12 subcontractors, which are conducting 195 tests. The firm's parent company is Tracor, Inc., which—like Litton—has developed enormously lucrative ties to the federal government (Tracor has 276 research and management contracts with 35 federal agencies). Tracor-Jitco's contract to help manage the bioassays was initially awarded on a competitive basis for $6.6 million in 1974. In 1975, the total amount of the contract was raised to $41.3 million without rebidding and competition.

The problems the firm had with overseeing Litton's subcontract work extended to other subcontractors as well. GAO inspectors found that Gulf South Research Institute, in Iberia, Louisiana, which has received $4.6 million from NCI, had listed improperly killed test animals as natural deaths. Another firm, Hazleton Laboratories of Vienna, Virginia, which has received $2.1 million, had failed to check the test animal's drinking water for impurities, used unapproved pesticides in test rooms, and moved a test in progress from one room to another.

Gilbert Maton, the president of Tracor-Jitco, told *Science* that most of these problems have been corrected since GAO's inspection in 1977, and that the GAO inspectors gave overall ratings of "acceptable" or "good" to the labs. Asked why his company failed to detect the deficiencies at Litton's Falls Church lab, however, Maton says he doesn't know. Any inference that the company has not been properly doing its job, he says, is all wrong. "I preach quality, vigilance, and persistence—hell, that's what this company is all about." Although Maton has an undergraduate degree in statistics, the firm's current project manager for the bioassays—there have been three in 5 years—has previous animal pathology experience at the U.S. Army Bioengineering Research Laboratory, on the Frederick campus. Maton, whose bookshelf supports a huge volume entitled, "The Art of Negotiating," says that more frequent laboratory inspections were not conducted by his firm because they were not authorized by the contract the firm had signed.

Griesemer, at NCI, acknowledges deficiencies in Tracor-Jitco's inspection reports, and says that "we make mistakes, occasionally." But he says the problems are not as serious as they might seem: 32 of the 51 bioassays judged too deficient for technical reports were studies of chemotherapeutic agents not in wide use; moreover, they were published in the literature as a single paper in *Recent Results in Cancer Research* (vol. 52), a German volume. Griesemer also says that NCI is installing a new computerized bioassay monitoring system, so the problems may be assumed not to persist.

But the point is not that errors persist, or that the testing labs have been incompetent. It is broadly agreed that both the immediate manager of the tests—Tracor-Jitco—and the overall supervisor—NCI—failed to detect flaws that could have rendered the tests inaccurate or unreliable. Most of the corrections were implemented only after congressional investigators began to sniff about. Before the investigations, NCI had made only one visit a year to the two labs under subcontract located within 30 miles of its headquarters. Moreover, the work of the third prime contractor for the bioassays, the Eppley Institute, has been characterized by similar problems, suggesting a broad pattern



When a chemical tracer was added to animal feed at the Frederick research center, it was detected later on walls and floors, in corridors, and on clothing and equipment. Photo shows technician feeding animals on test.

GAO visited the Falls Church lab and found holes and cracks in the ceilings, walls, and floors.

of inefficient management by NCI. NCI's contract with Eppley was renewed without competition with justifications "not totally supported by the facts," according to GAO. Reportedly, 53,000 animals were overbred or killed at the facility, at a cost of $65,000. HEW is now attempting to get $1.1 million back from the laboratory (for work other than bioassays), and both the FBI and a grand jury are reportedly investigating mismanagment of federal funds.

Furthermore, when corrections were made, NCI typically has not penalized the contractors for bad behavior. Each of the prime contracts was "cost-plus"—which means that the federal government meets all costs (plus in some cases a fixed fee), and offers a substantial award fee as an incentive for good work. Award fees at the Frederick center averaged 75 percent of their potential amount during Litton's early management, an amount that the House investigative staff called "a handsome profit" and "probably exorbitant." It was not until November 1977 that the bioassay budget at Frederick was renegotiated and reduced by 40 percent—at the same time, the center's bioassay staff was completely replaced. Despite the reduction, each bioassay conducted at Frederick wound up costing $300,000, far more than most smaller contractors and universities would charge.

Tracor-Jitco has received roughly $3.2 million in award fees from NCI, although this is only about 52 percent of what it might have earned with perfect performance. Considering that 52 percent is the standard award, NCI might have been expected to penalize the company with a lesser award after the latest GAO report. The most recent award, however, was 52 percent. Recently, NCI director Upton testified before the Senate appropriations committee that the Tracor-Jitco contract would be phased out within 3 years, and that NCI staff would assume direct responsibility for subcontracting the bioassays. Upton promised that no new tests would be started under the Tracor-Jitco arrangement, although the firm would receive another 4-year contract of $65 million—$22 million more than its present agreement—to monitor tests it has already begun. Senator Magnuson noted that it was like "Tracor-Jitco was making their own report card. They competed only for the first $6 million (back in 1974), and for the next $105 million there was no competition." He told Upton that "it seems to me that you've got yourselves locked in"—which Upton denied. Subsequently, however, it was learned that most of the tests to be monitored under the new contract are in fact not yet under way, but were subcontracted within weeks of the end of the old contract. The effect of such a maneuver was virtually to guarantee that the Tracor-Jitco contract would be extended for another 4 years.

David Rall, director of NIEHS and chairman of a bioassay coordinating group, acknowledges that this "doesn't look good." The as-yet-unstarted bioassays were "viewed as having been started because the planning was complete. It is theoretically possible to disengage," in light of the GAO report, he says, but it would be expensive to buy off the subcontracts. Upton adds that if another firm had taken over the contract after formal competition, "we'd be up to our ears in trouble" with the new managers, and a 1-year testing delay could result.

NCI wants to avoid such a delay because of strong congressional pressure to increase the number of chemicals being tested. Two years ago, the program received a substantial increase in appropriations expressly to increase the number of new tests to 120 in 1979. Gregory O'Connor, a pathologist who currently directs the NCI division in which the bioassay program sits, in February proposed instead to reduce the number of new tests to 57, telling a congressional aide that the "bioassays are not the most cost-efficient way to spend the resources of my division." Representative David Obey (R-Wis.), a member of the appropriations subcommittee that handles NCI, intervened with HEW Secretary Califano, and National Institutes of Health (NIH) Director Donald Fredrickson, and the result was an NCI compromise of 72 new tests—all managed by Tracor-Jitco. Had NCI dropped the Tracor-Jitco contract and delayed the tests, it would have offended Obey in the House; now, by extending the contract, it has offended Magnuson in the Senate. The argument over who is right—over which bioassay flaw is the most serious—clearly could wreak havoc in NCI's budget.

The program is also threatened by internal arguments. Perhaps the most serious is the inability on the part of top NIH and HEW management to decide who should assume ultimate responsibility for the tests. Last fall, Califano transferred part of the authority for it to the newly formed National Toxicological Program (NTP), a consortium of top federal regulators that includes the NCI director. NCI currently retains authority for day-to-day management, but the arrangement is not permanent, and considerable uncertainty about the future has hindered the hiring of NCI toxicologists and pathologists whose positions were authorized by Congress 3 years ago.

Last year, Representative Obey told Fredrickson that NCI would be reluctant to commit personnel and resources to the bioassays as long as it was unsure of holding on to them. Fredrickson responded, "I think you are correct. There are turf problems . . . particularly important here. One of the greatest questions yet to be decided is whether the national interest is best served in having this located in a research or regulatory agency."

Upton, who has decided that NCI should try to keep the program, recently asked top staff members to prepare a recommendation for a new division of cancer prevention in which the bioassays would have a prominent spot. He acknowledges that the competition between NCI and NIEHS has had an effect on the quality of the program. "There has been some tugging, ambiguity, confusion, and stress and strain," he says, "but it has not been inordinately troublesome. If you look across the world and compare it with what is being done anywhere else, what we're doing is very good. This is not to say that we have been perfect." The agency would like another chance, he says. "NCI cannot carry out the intent of Congress if it lets go of the bioassay program. That would be an abdication of our responsibility."

"There has been some tugging, ambiguity, confusion, and stress and strain," says Upton.

As more and more observers review the agency's well-established record with the program, it seems less and less likely the agency will get that second chance. David Rall is tactful: "We probably will assume more of the responsibility, and in the near future, some people may choose to work down in North Carolina." But the reaction of a congressional aide active in NCI matters to the latest damning reports was, "Maybe we'll just ship the whole thing south [to NIEHS]."—R. JEFFREY SMITH