

nant DNA research. The board, he said, "can't make good judgments because the technology of science is changing so rapidly. The board doesn't reflect that [change]." Acting deputy director Jane Henney said later that, in the opinion of some NCI officials, the cancer institute has sufficiently expanded its program in environmental carcinogenesis so that it now needs to concentrate its efforts in other areas.

The panel then discussed Fisher's concern that the grants approval process is tangled in bureaucratic red tape, a belief held by many researchers. By his staff's own estimate, Fisher said that he has spent 4 of the past 11 years in research just dealing with the mechanics of the grants system such as filing applications. The phenomenal growth in applications

"has strained the system," he said. "There is dissatisfaction and unhappiness by researchers, but how much of the criticism is valid is not known. Is it time to make changes?" Amos added that he would like to see imaginative grants funded more often.

Fisher said that researchers "may have to live with what we have," but proposed that another evaluation be made of the grants system, including the merits of the peer review system. He suggested that the current system may not allow the most knowledgeable scientists "with the scope and orientation needed to review the application properly."

DeVita replied that hearings may be tentatively scheduled across the country at major medical centers to give re-

searchers a chance to voice their complaints.

All in all, the cancer panel appears to be taking on a more active role than it has in its recent past. The new chairman is off to a flashy start by offering a \$1 million purse for a cancer cure. But the money is unlikely to speed up the discovery of an ultimate weapon against cancer, given the billions of federal dollars that have been pumped into the cancer program so far and given the complexity of the disease. What remains are tougher issues: whether the direction of research at the institute is appropriate, how the grants system can be improved, and whether the advisory board should be changed. They are questions that a million dollar cash prize cannot answer.

—MARJORIE SUN

Consensus on CT Scans

An NIH consensus panel believes that too few CT brain scanners are available, not too many

"CT is a remarkable new development in radiographic imaging which, in only 8 years, has transformed the diagnosis and much of the management of structural disease of the brain and its surrounding tissue." So begins the report of a recent consensus development conference* on computed tomographic scanning of the brain. The consensus development panel, convened by the National Institutes of Health, was extremely enthusiastic

devices to machines that have become indispensable. "CT to a neurologist is like chest x-rays to an internist," said Ronald G. Evens of Washington University School of Medicine. There is now one CT scanner for every 60,000 persons in the United States. Despite the fact that the states have limited the availability of the machines by requiring that hospitals submit certificates of need before receiving permission to buy CT

the design of the scanners and in computer technology, the newest machines can scan a head in just 10 seconds and can reconstruct an image virtually instantaneously. According to Jay Thomas Payne of Abbott Northwestern Hospital in Minneapolis, the Mayo Clinic's first CT scanner, which is only 5 years old, has been relegated to the clinic's historical museum.

The primary indications for CT scans, the consensus panel said, are to diagnose brain tumors, brain hemorrhages, the effects of major head injuries such as occur in auto accidents, and certain infections of the brain, such as encephalitis.

As an example of how useful CT scans have become, Donald T. Becker of the Medical College of Virginia, Richmond, discussed the machine's impact on the diagnosis and treatment of blood clots in the brain following head injuries. "Previously, we would wait for neurological signs of a lesion, but by that time the patients would almost always have remaining neurological deficits," he said. Once there were signs of a lesion, Becker continued, "we used to do angiography, which is invasive and takes at least an hour, or pneumoencephalography, or we would bore holes in the skull and look for the clot. Now, with CT, we don't do those things anymore. CT can

"CT to a neurologist is like chest x-rays to an internist."

about CT scans, concluding that the main difficulty with them is not overuse, as was feared by health planning agencies when CT was first introduced, but rather that too few scanners are available.

During the 2-day conference, speakers told the extraordinary story of the evolution of CT scanners from experimental

scanners, the United States is surpassed only by Japan in the number of scanners per capita. Of the 4000 scanners worldwide, one-third are in the United States, one-third are in Japan (which has half the population of this country) and the remaining third are scattered throughout the rest of the world.

When CT scanners first became commercially available about 8 years ago it took 5 minutes to scan a patient's head and 5 minutes for each computerized reconstruction of an image from the x-ray data. Now, because of advances in

*The Consensus Development Conference on Computed Tomographic Scanning of the Brain was held on 4 to 6 November 1981, and was sponsored by the National Institute of Neurological and Communicative Disorders and Stroke and the National Cancer Institute.

tell us where the mass is and how to remove it. It tells us whether there is underlying brain injury and it tells us whether to open the dura [the membrane covering the brain] and where in the brain to go to remove the clot."

Not unexpectedly, however, doctors sometimes use CT scans on occasions when it is unlikely that the scans will provide any useful information. Although the scanners have narrowly focused x-ray beams with little scatter, they do nonetheless use several x-ray beams for each scan. As David G. Brown of the Bureau of Radiological Health of the Food and Drug Administration said at the conference, "A CT scan of the brain is not a low-dose procedure." The average dose from a CT brain scan is 1 to 10 rads, which is comparable to five or six conventional skull x-rays.

The consensus panel concluded that CT scans are not indicated for adults who have minor head trauma, simple or periodically occurring headaches, or dizziness with no other signs or symptoms. Because CT scans cannot show metabolic abnormalities in the brain but only show structural abnormalities and lesions, they are unlikely to be of much use in these cases.

The panel was particularly concerned about the possible overuse of CT scans

in children, cautioning that "the effects of repeated cumulative low-level radiation doses to the immature developing brain (particularly from birth to 2 years of age) are unknown." CT scans are indicated for children with conditions such as severe head trauma, coma, and abnormally large heads, but they probably should not be used to evaluate children with developmental retardation, cerebral palsy, seizures, or headaches, the panel advised.

Although CT scans are expensive, costing an average of \$180 to \$300 per scan, and although the scanners themselves cost from \$100,000 to \$1 million, the conference participants argued that the advent of CT scans has actually decreased medical costs. The scans substitute for more complicated and lengthy procedures, many of which require hospitalization.

For example, David Norman of the University of California at San Francisco says that in his hospital, CT scans replaced procedures costing \$2000 to \$3000 for the diagnosis of pituitary tumors. Physicians used to request a series of skull x-rays, an angiogram, radionuclide studies, and a pneumoencephalogram to diagnose a tumor. Now they just do a CT scan, and the average presurgery hospital stay decreased from 5.7 to 1.5 days for patients with these tumors.

Because CT scanners save money and are, as David O. Davis of George Washington University in Washington, D.C., said, "the most effective tool in neurology," the conference participants spoke bitterly of regulations that limit their availability. Public hospitals and medical schools must file certificates of need with state planning boards before they can have permission to buy scanners. The legal costs for obtaining these certificates of need can be as much as \$100,000 and there is no guarantee that these requests for scanners will be granted. As Alan Cormack of Tufts University, who won a Nobel Prize for his role in originating CT scans, said, "For \$100,000 you can buy a good head scanner." In contrast, neurologists and private hospitals can and often do buy as many scanners as they want. Fred Plum, of Cornell University Medical College, who was chairman of the panel, said that in Connecticut the state planning board initially allowed only two scanners for this state with 3½ million people. He remarked, "Certificates of need have sharply reduced the capacity of large hospitals to add scanners but have placed no restrictions on the private sector. The result is that those most often subjected to trauma tend to have the least availability of the scanners."

—GINA KOLATA

Cleaning Up the Clean Air Act

A Brookings paper finds that good luck, not good regulation, reduced pollution in the 1970's

Contrary to popular myth, enforcement of the Clean Air Act has not been responsible for the general improvement in air quality since the 1960's, according to a new report issued by the Brookings Institution.* Most of the improvement in the last decade may be attributable to the "good luck" of a limping economy and the continuing substitution of clean fuels (oil and natural gas) for coal. That is the conclusion of Brookings economist Lester Lave and science fellow Gilbert Omenn, who was an Office of Management and Budget official in the Carter Administration. This finding is vigorously challenged by environmentalists.

* L. B. Lave and G. S. Omenn, "Cleaning the air: reforming the clean air act" (Brookings Institution, Washington, D.C., 1981).

The authors of the paper agree that controls imposed by the Environmental Protection Agency (EPA) have reduced emissions from new plants and new automobiles. But they claim that "the application of pollution controls to existing plants and older cars has been limited, and costs have been excessive, largely because Congress has failed to confront the difficult issues" of how to attack problems that predated the legislation. Lave and Omenn conclude that "a major revision of pollution abatement policy is required" and argue that if the government fails to undertake a radical revision of the Clean Air Act, it will be unprepared for the problems of the 1980's and 1990's. They write, "As the economy expands and national energy policy

forces a return to coal, air pollution could get markedly worse."

The authorization for the Clean Air Act of 1970 expired in September and, pending renewal, the law is being kept alive by a continuing resolution. Hearings are under way in both the House and Senate, but there is little prospect of new legislation before next year. The Brookings paper is clearly intended to spur Congress to try some innovative rewriting of the law. Lave and Omenn say that it would be a great disservice for Congress to perpetuate the arbitrary rules now in effect. "Minor polishing of rough edges will not be sufficient," they write. And they propose five general guidelines for reform.

● First, Lave and Omenn say that the