Diagnosing cancer with radioantibodies

The notion of exploiting the body's immune system to treat cancer has been around for a few years now. And it has scored some coups. For instance, a vaccine that primes a cancer patient's immunity against cancer has saved some lives, and transfer factor, a chemical extracted from immune cells and injected into cancer patients, has helped some cancer patients overcome cancer. Efforts to use immunity as a diagnosis for cancer are also starting to bear fruit.

For instance, Chicago scientists recently devised an immune test for certain antigens prevalent in breast tumors and found that it can diagnose breast cancer in women (SN: 3/25/78, p. 180). And now Lexington, Ky., investigators report still another promising method — using radioactively labeled antibodies to diagnose various kinds of tumors — in the June 22 NEW ENGLAND JOURNAL OF MEDICINE.

The research that first made such a diagnostic tack possible was the discovery in the 1960s of a protein that seemed to be specific to the surface of cancers of the gastrointestinal tract. It was named the carcinoembryonic antigen (CEA). CEA has since been found not to be restricted to the gastrointestinal tract, nor, in fact, always to be specific for cancer. However, more CEA does appear to be present in tumors than in normal tissues. So David M. Goldenberg and his colleagues at the University of Kentucky College of Medicine at Lexington asked whether CEA might serve as a target for radioactively labeled antibodies specific to it, and thus alert physicians to the presence of tumors containing lots of CEA. They conducted a scientific study to find out.

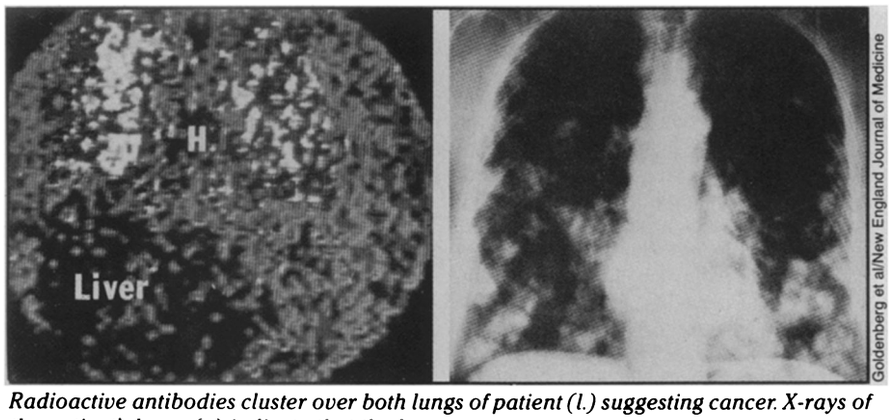
First, they made antibodies to the CEA antigen, purified them and labeled them with radioactive material. The researchers then injected the antibodies into 18 patients known to have diverse kinds of tumors. The patients' bodies were then exposed to a gamma scintillation camera, which was capable of imaging the radioactive antibodies in whatever area of the patients' bodies they settled.

The body scans revealed the antibodies honing in on select tissue sites in the patients, and all the sites had been shown by other diagnostic means to be the location of tumors. For instance, antibodies could be seen to aggregate over both the lungs of one patient, and X-ray diagnosis of the lungs of this patient indicated that a spreading tumor was present in this location (see illustration). What's more, the scans indicated evidence of tumors in four patients that had not been diagnosed by other means, but that were later confirmed by operation or autopsy. Thus the antibody imaging technique seems capable of diagnosing tumors.

Nonetheless, the technique is not foolproof. In one patient, for instance, spreading brain cancer documented with a computerized tomography scan was not seen on the radioantibodyscan, possibly because the radioantibody could not pass through the blood-brain barrier, a network of blood vessels in the brain that selectively keep certain chemicals out of the brain. Then there was one patient in whom neither a primary nor a secondary tumor could be identified by antibodies; this patient had a lymphocytic lymphoma, a tumor type known to be devoid of CEA.

Still another drawback of the technique: Tumor blood flow may aid antibody deposition in the tumors, but it may also hinder discernible tumor imaging because of increased blood-pool background radioactivity. However, CEA circulating in the blood of patients does not seem to affect radiolocalization of CEA-bearing tumors.

On the whole, Goldenberg and his colleagues contend, the technique looks promising in the detection of tumors and might well prove a useful adjunct to other cancer diagnostic techniques now available. They also believe that the technique should become even more valuable as antigens more specific to tumors than CEA is are identified. Then, radioactively labeled antibodies to these antigens could be used instead of labeled antibodies to CEA, providing even more accurate diagnosis of tumors than CEA antibodies provide. □



Radioactive antibodies cluster over both lungs of patient (l.) suggesting cancer. X-rays of the patient's lungs (r.) indicate that the lungs are cancerous.

OTA backs growth of "onsite" solar

It reads like a hard-headed battle plan for the rise of "small is beautiful" solar. Cost comparisons. Equipment 10 to 15 years from now. Economics of growth. Federal policy for promotion and regulation. Legal problems. Integration with conventional utilities. Impact on foreign policy. And it doesn't stop there. The 525-page report, recently presented to Congress by the U.S. Office of Technology Assessment, makes a prediction as well, saying that small-scale solar equipment could compete with conventional energy utilities by the mid 1980s. All it takes, the report notes, is "aggressive federal support."

Congress asked OTA for the report in the belief that federal solar energy planners had ignored small, "onsite" equipment in favor of centralized generating systems. Onsite equipment is mounted on or near the building it serves. Although some generate electricity, many of these systems use the sun's thermal energy for direct hot water and space heating or for industrial process heating, air conditioning and refrigeration.

The report starts with performance comparisons of onsite solar equipment in Albuquerque, Boston, Ft. Worth and Omaha. The sites show wide climatic variation. But more important, they show a range of conventional fuel costs, which vary even more than the available sunlight. In each area, computer simulations were made for a single family dwelling, a 196-unit high-rise apartment, a shopping mall, a whole residential community and a variety of industries.

Sweeping generalizations are rare and give way in most places to detailed charts, tables and graphs. However, while testifying about the report before the Senate's Energy R&D subcommittee, Russell W. Peterson, director of OTA, said that if the whole "life cycle" and not just the initial cost of the system is taken into account, solar heat and hot water can already compete with electric utilities in many parts of the country. With federal support, he said, solar heat and hot water could also vie with oil and gas by the mid 1980s. Solar heat will not be able to compete with the direct combustion of coal before the end of the century. But solar electric systems could produce electricity at 4 to 10 cents per kilowatt hour by the late 1980s — and thus compete with centrally generated electricity. These predictions do not assume "breakthroughs" in research.

"Our analysis has indicated," Peterson said, "that by the end of the next decade, the range of costs which can be plausibly forecast for energy from onsite solar energy equipment will overlap the range of costs which can be forecast for nonsolar systems in energy markets representing