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******UTHSCD's nuclear magnetic resonance center receives funding for research in body metabolism.

DALLAS--In the quest to peer inside the living human body, medical science stands at a new threshold.

Powerful magnets, now used to produce vivid images of human anatomy, have been given a second, perhaps even more demanding, task.

Through the process called nuclear magnetic resonance (NMR) spectroscopy, scientists are now employing even stronger magnets to reveal the intricate nature of chemical processes within the body.

NMR, or more commonly "magnetic resonance imaging," is beginning to provide results of metabolic, or chemical, activity inside living human tissue. Based on a force that is very basic to life--magnetism--scientists are actually "seeing" the workings of chemicals within human cells without the use of X-rays.

To produce this new class of results, which appear as graphs composed of peaks and valleys, the NMR technology used to produce CAT scan-like images is altered slightly and its radio pulse is changed to a different frequency to detect specific chemical elements. Now chemicals appear as spikes or dips in a graph according to their quantities in a particular tissue area.

By knowing normal amounts of these chemicals, scientists are able in a number of circumstances to tell how cells are metabolizing and producing energy, how drugs are being metabolized and how disease can be detected early for preventive treatment.

Recently, researchers at The University of Texas Health Science Center at Dallas's Biomedical Magnetic Resonance Center were given $2.7 million to pursue their efforts in NMR study on an even larger scale. These efforts began in 1978, when Drs. James Willerson, director of the Ischemic Heart Center, and Robert Parkey, chairman of the Department of Radiology, first decided to purchase a magnet for cardiac research.

The five-year research grant, awarded to the center by the National Institutes of Health's Division of Research Resources, establishes the health science center as a Biotechnology Regional Resource, providing access to the research facility for investigators from within Texas and surrounding states. This is one of only nine such facilities for NMR research in the United States.

Research activities will aim at refining and extending NMR technology and will explore ways of applying the technology to the solution of clinical problems, such as coronary artery disease, important pediatric health problems, multiple sclerosis and cancer.

"The NIH grant enables us to buy an NMR machine that is truely a state-of-the art device, operating at a magnetic field

(more)

of 4.7 Tesla, more than double the strength of other NMR whole-body machines," says project director Dr. Ray Nunnally, assistant professor of radiology and director of the UTHSCD Biomedical Magnetic Resonance Center. This new magnet, measured in the international unit of magnetic flux density (Tesla), is roughly 90,000 times as strong as the earth's residual magnetic field.

Nunnally, who expects the machine to be delivered by late 1986 or early 1987, says that to date, animal studies have revealed no safety problems, even with magnets of greater strength than this. "Still, the new machine will not be used for routine clinical purposes until we can document that it can be used safely and without health hazards," he adds.

Also, the University of Texas System has tentatively approved, for planning purposes, a grant to the magnetic resonance center for construction of an NMR building on the UTHSCD campus and is providing additional research support to the NMR center. The building will be designed to house the new NMR equipment along with the two NMR machines already in operation at the health science center. These machines have an operating power of .35 Tesla and 1.8 Tesla, or significantly less than half the power of the new machine.

"The new funds, together with previous generous community contributions and an existing NIH research grant, will place the health science center at the forefront of NMR research technology," says Parkey. The existing grant consists of $600,000, given to Nunnally for NMR studies as part of a larger grant for the UTHSCD Special Center for Research on ischemic heart disease.

The health science center's strong NMR research program has been a collaborative effort, Nunnally says. Besides an active program of NMR imaging, there are several metabolic studies under way. For example, researchers are looking at ways of assessing the amount of injury to the heart after a heart attack.

"NMR will give better definition of a heart attack, determining whether there is temporary or permanent damage to the heart and therefore will tell to what extent the heart is not functioning," says Nunnally.

"NMR may allow us to identify patients at risk of having a heart attack and subsequently prevent heart attacks from happening in the future," says Willerson. "This may be done by non-invasive evaluation of changes in coronary blood flow and metabolism and serve as a warning of blood vessel narrowing.

"NMR also may give better definition of the process of a heart attack so that measures can be taken to protect the heart during a heart attack," Willerson says. "NMR imaging may provide fundamental insights into the mechanisms responsible for heart muscle dysfunction. Among these conditions is cardiac myopathy."

In addition, NMR studies are in progress in the area of pediatrics since NMR is much safer to use on children than other radiologic techniques using X-rays. A group of UTHSCD researchers is looking into pediatric nutritional disorders in infants with low birth weight and metabolic abnormalities to see if early intervention and treatment are possible.

Another area of study involves cancer research. NMR may help in determining the effectiveness of hyperthermia (using heat to treat tumors), either alone or with drugs, in the treatment of tumors by gauging its effects on tumor biochemistry.

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