Dynamic Light Scattering Developed to Look Through the Eye's Window Into the Body

Dr. Ansari utilizing fiber probe to look into the window of the body.

Microgravity researcher Dr. Rafat R. Ansari, from the NASA Glenn Research Center, has found that the eye operates much like a camera and is the "window to the body." The eye contains transparent tissue through which light passes, providing us a view of what's going on inside. These transparent tissues represent nearly every tissue type that exists throughout the body. With the correlations and comparisons of these tissues done at Glenn, we hope to improve doctors' ability to diagnose diseases at much earlier stages. The medical community will be able to look noninvasively and quantitatively into a patient's eyes to detect disease before symptoms appear. Since the eye is easily accessed by light, the optical technologies created at Glenn can be used to evaluate its structure and physiology in health, aging, and disease.

These efforts have been concentrated into four areas of study: cataracts, diabetes, age-related macular degeneration (AMD), and Alzheimer's disease. Ophthalmic instruments with dynamic light scattering (DLS) capabilities, which were recently developed at Glenn, can diagnose cataracts at the molecular level. The fiber-optic probe also can be used for the early detection of vitreous diseases, including diabetic retinopathy and asteroid hyalosis. In addition, it can monitor blood sugar and cholesterol levels without taking blood samples.

Age-related macular degeneration, which damages and destroys the central vision of up to one in three people in the United States in their lifetime, has no known cause or cure. It is predicted that this disease may soon take on aspects of an epidemic. We hope to detect this disease earlier by measuring blood flow through the choroids region in the back of the retina and better monitor it with this new technology.

Many of the world's aging population are currently afflicted with Alzheimer's disease. The

only current method of diagnosing Alzheimer's is through an autopsy. Brain tissue is examined through a microscope to detect a protein substance called amyloid, which is deposited in the brains of people with the disease. This research will allow physicians to look into the eye tissue for amyloid protein, the same substance found in the Alzheimer's patient's brain. If the disease is detected at earlier stages, patients may be helped with anti-inflammatories, antioxidants, or hormone replacement therapies.

Using helmet-mounted "space-vision" or night vision goggles (similar to those used by F-16 pilots), doctors will be able to monitor the health of future space travelers and to detect cataracts, diabetic retinopathy, Alzheimer's disease, age-related macular degeneration, and retinal detachment. The goggles will allow doctors to remotely observe electroencephalograms (EEG's) and heart monitors and record body temperatures. This apparatus will also assist patients that live in distant areas with limited medical facilities. The information gathered through the goggles could be transmitted via satellite to doctors and medical personnel at more sophisticated urban medical centers.

Glenn contact: Laurel J. Stauber, 216-433-2820, Laurel.Stauber@grc.nasa.gov
National Center for Microgravity Research contact: Dr. Rafat R. Ansari, 216-433-5008, Rafat.R.Ansari@grc.nasa.gov
Author: Laurel J. Stauber
Headquarters program office: OBPR
Programs/Projects: HEDS