Trafficking in Proteins

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Proteins work hard: they are the main elements of bones, muscles, hair, skin and blood vessels. They fight off disease, regulate tumor growth and produce all the energy in the human body. But before they can do this amazing work, they must first reach those specific spots in cells where they receive the trigger to begin functioning.

The Department of Energy has notified University of Arkansas scientists Ralph Henry, T.K.S. Kumar and Robyn Goforth that they will receive a $450,000 grant to continue their research in protein targeting. The group, all researchers in the J. William Fulbright College of Arts and Sciences, has won two previous $450,000 grants from the department. Henry is the principal investigator for the project.

The team studies how proteins travel in plant cells from where they were created to the compartments where they are programmed to function. During the journey, they will take seemingly indirect routes and pass through lipid membranes that are difficult to cross.

If scientists better understood this protein trafficking, or complex movement between cell compartments, they could turn that knowledge into useful applications. By manipulating the protein's movements, for example, a scientist could develop membranes that capture light and in turn generate electricity. Because plant cell compartments and bacteria are similar, Henry and his colleagues believe that manipulating pathways in bacteria could produce larger quantities of important medicines that bacteria produce, such as insulin.

Henry and Goforth study tobacco and garden pea plants in their research to understand how protein interactions lead to protein movement in cells. Kumar employs nuclear magnetic resonance spectroscopy to determine the three-dimensional structures of proteins. Using NMR, Kumar can immerse a sample in a magnetic field and bombard it with radio waves. The molecule's nuclei begin to spin, and measuring the frequencies of these spins helps determine many properties of a molecule, including its structure.

"The more basic the science, the less likely people are to be interested in it. But when such work uncovers potential therapeutic effects or leads to the development of new anti-microbial agents, then people can more fully understand the value of this research being conducted in laboratories around the country," said Henry.

The three are all members of the Center for Protein Structure and Function at the University of Arkansas, directed by Professor Frank Millett. They are also supported by the Arkansas Biosciences Institute.

Source: University of Arkansas