Looking at neurons from all sides

April 27 2008

A new technique that marries a fast-moving laser beam with a special microscope that look at tissues in different optical planes will enable scientists to get a three-dimensional view of neurons or nerve cells as they interact, said Baylor College of Medicine scientists in a report that appears today in the journal *Nature Neuroscience*.

“Most microscopes can only study cell function in two dimensions,” said Dr. Gaddum Duemani Reddy, an M.D./Ph.D. student at BCM at Houston and Rice University and also first author of the study. “To look at different planes, you have move your preparation (of cells) or the objective lens. That takes time, and we are looking at processes that happen in milliseconds.”

To solve that problem, he said, they developed a “trick” to quickly move a laser beam in three dimensions and then adapted that laser beam to the multi-photon microscope they were using. That allowed them to “see” the neuron’s function in three dimensions, giving them a much better view of its activity.

A multiphoton microscope looks much like a conventional, upright microscope but it has an adaption that allows it to look at tissues in sections. A conventional multiphoton microscope does that very slowly, he said.

“With ours, you can do it very quickly. We are starting to see how a single neuron behaves in our laboratory,” he said. The next step, he said, will be to use to it to look a clusters or colonies of neurons. This will

enable them to actually see the neuronal interactions.

“At present, the technology is applied in my lab to study information processing of single neurons in brain slice preparations by 3D multi-site optical recording,” said Dr. Peter Saggau, professor of neuroscience at BCM and the paper’s senior author.

He is collaborating with two other labs on using the technology in other ways. In one, he said, researchers plan to use the technology to monitor nerve activity in the brains of lab animals in order study how populations of neurons communicate during visual stimulation. Another study attempts to use the technology to monitor stimulation of the acoustic nerve optically. Those scientists hope to reinstate hearing in lab animals whose inner ear receptors do not work.

Source: Baylor College of Medicine