Ming Guo, M.D., Ph.D.

To meet and chat with Dr. Ming Guo, you would never know that this charming, gentle young woman runs a lab at UCLA where her work is having a significant impact on advancing our insights into the two most common neurodegenerative disorders of the brain, Alzheimer’s and Parkinson’s diseases. Her work on Parkinson’s disease has been internationally recognized as ground-breaking and field-defining.

“I chose to specialize in neurology because, really, life is brain,” she says. “The brain is the essence of a human being. It’s who we are. It contains so many mysteries and a lot of diseases. Also, neurology is a young profession. You can still contribute to the growth of the field.”

Guo’s goal is to understand the molecular mechanism—the function—of genes in the body in order to find a cure for Alzheimer’s and Parkinson’s diseases.

She is well on her way. Her lab has made important findings in the field of neurodegeneration using Drosophila (fruit flies) as a model. As the second most common neurodegenerative disorder, Parkinson’s disease affects 5% of people over the age of 80, and no treatments can halt the progression of the disease. Dopamine replacement-based therapy only works well on the earlier stages of motor symptoms. Patients in the late stages and their non-motor symptoms usually do not respond well to this therapy.

Dr. Guo’s lab studies recently identified genes which mediate familial Parkinson’s disease, such as PINK1, parkin, and LRRK2, in order to understand the pathogenesis of the disease. Using the Drosophila model, her group was one of the first two in the world to report the function of the PINK1 gene, and that PINK1 and parkin function in a common genetic pathway to regulate mitochondrial integrity.

Her studies in Drosophila are key to understanding the fundamental cellular defects in Parkinson’s disease patients. Mutations of the PINK1 gene are common causes of autosomal recessive Parkinson’s disease. Dr. Guo demonstrated that the loss of PINK1 in Drosophila leads to defects in mitochondrial function in multiple tissues including dopamine neurons and muscle. The fact that Drosophila lacking PINK1 could be rescued by human PINK1 demonstrates that there is some functional conservation of the gene across species. The understanding of the cause of Parkinson’s disease may significantly benefit the development of new therapeutic approaches for its treatment.

“If this model is correct, Parkinson’s disease perhaps results from accumulation of damaged mitochondria. It suggests that the goal should be to develop pathway-specific therapies that would allow us to optimize the treatment potential and minimize side effects,” says Guo.

Why Drosophila? According to Guo, 75 percent of human disease genes have Drosophila counterparts and the biological pathways are conserved. “They have a short generation time, and are easy to work with. From here, we will move into studying disease in humans.”

She explains that Alzheimer’s, Parkinson’s, and ALS are all age-dependent diseases. “Our ultimate goal is to improve the quality of mitochondria to dial back the aging clock. Basically, we want to make fabulous mitochondria!”

A mentor, Guo directs a lab with five postdocs, five graduate students, four undergraduates, and a technician. The trainees in her lab have enjoyed outstanding success.

In addition, as a Board-certified neurologist, she spends 20 percent of her time caring for patients with neurological diseases. “My clinical work has provided me with a constant source of motivation and deep understanding of the diseases for my research,” she says.

Guo currently holds several active grants, including four NIH grants. She is the recipient of prestigious private foundation awards, including the Alfred P. Sloan Foundation Award, the McKnight Foundation Brain Disease Award and the Klingenstein Fellowship. She was selected among the 10 fellows as the 12th Robert H. Ebert Clinical Scholar, outstanding physician-scientist of the year. She was 2009 recipient of the prestigious Derek Denny-Brown Neurological Scholars Award, given annually to a newly elected member of the American Neurological Association who promises to make a major contribution to the field of neurology.