Researchers identify enzyme that makes survival molecule for key vision cells

June 26 2009

Research lead by Dr. Nicolas Bazan, Boyd Professor and Director of the Neuroscience Center of Excellence at LSU Health Sciences Center New Orleans, identifying an enzyme that makes neuroprotectin D1 which specifically and selectively protects retinal cells key for vision, will be published in the June 26, 2009 issue of the *Journal of Biological Chemistry*.

Dr. Bazan's research team previously discovered neuroprotectin D1 (NPD1), a naturally produced chemical messenger that protects cells from injury caused by free radicals and other oxidative stress. Neuroprotectin D1 is derived from the omega-3 fatty acid, DHA (docosahexaenoic acid) which is present in both brain and retinal cells.

Retinal pigment epithelial (RPE) cells are essential for the survival of rod and cone photoreceptor cells. RPE cells regulate the renewal of the tips of photoreceptor cells among other functions. When RPE cells do not function properly, photoreceptor cells are damaged and can die, leading to decreased vision and eventual blindness as in such conditions as retinitis pigmentosa and age-related macular degeneration. A number of stressors, including free radicals, damage RPE cells. Dr. Bazan's lab has shown that RPE cells produce NPD1 in response to oxidative stress. The focus of this research project was to further define that process.

The LSUHSC team's main participant was Jorgelina Calandria, a PhD student in the LSUHSC Neuroscience Center Graduate Program working with Dr. Bazan, along with Pranab Mukherjee, PhD, Research

Assistant Professor. Calandria developed a stable cell line to explore the role of an enzyme called 15-LOX-1 that they believed might play a key role in the process of converting DHA into NPD1. They designed a series of experiments using cells with, and those deficient in, 15-LOX-1, and measured response to oxidative stress. They found that the cells deficient in 15-LOX-1 were more vulnerable and susceptible to cell death and that NPD1 production in those cells was also diminished, demonstrating that 15-LOX-1 is key to the production of NPD1. The team also conducted experiments where retinal cells deficient in 15-LOX-1 were treated with NPD1. NPD1 was able to selectively and successfully rescue them, demonstrating the protective power of NPD1 in RPE cells.

"These studies have created a new interest in RPE cells not only due to the potential applications in the treatment of retinal degenerative diseases, but also in neurodegenerative diseases such as Parkinson's disease," notes Dr. Bazan. "This research has helped us define NPD1 survival bioactivity in the RPE cell. It is clinically significant because it underpins the exploration of therapeutic interventions for diseases affecting millions."

According to Research to Prevent Blindness, an estimated 1.75 million Americans over age 40 have decreased vision from Age-related Macular Degeneration. That number is expected to increase to 3 million by 2020.

The National Institutes of Health estimates that at least 500,000 people in the US currently have Parkinson's disease, although some estimates are much higher. The risk of Parkinson's disease increases with age, so the impact of this disease is expected to increase as the population ages.

Source: Louisiana State University Health Sciences Center