Study uses Chinese wolfberries to improve vision imperfections caused by type-2 diabetes

March 30 2010

Dingbo "Daniel" Lin is using dried wolfberries and examining their effects on the retina pigment epithelial cell layer. Credit: K-State media relations

A Kansas State University researcher is exploring the use of Chinese wolfberries to improve vision deficiencies that are common for type-2 diabetics.

Dingbo "Daniel" Lin, K-State research assistant professor of human nutrition, is studying wolfberries and their potential to improve damage to the retina. His findings show that the fruit can lower the oxidative stress that the eye undergoes as a result of type-2 diabetes.

"I would not say that wolfberries are a medicine, but they can be used as

a dietary supplement to traditional treatments to improve vision," Lin said. "Wolfberries have high antioxidant activity and are very beneficial to protect against oxidative stress caused by environmental stimuli and genetic mutations."

Lin has experience in biochemistry and eye research, and he wanted to bridge his current work in nutrition with vision. In a conversation about the eye and phytochemicals Lin had with his father, a traditional medical doctor in China, Lin decided to explore the use of wolfberries for vision improvement.

"In our culture's history, we have traditional medicine literature that describes things like the wolfberry and its functions," Lin said.

Wolfberries are bright orange-red, oblong-shaped and grown in China. Lin said the fruit is known to help rebalance homeostasis, boost the immune system, nourish the liver and kidneys and improve vision. He wanted to understand the mechanisms of the wolfberry's effects on vision and started the project in July 2008.

Lin and his colleagues have found that wolfberries have high levels of zeaxanthin, lutein, polysaccharides and polyphenolics, which have been shown to improve vision, including the prevention of age-related macular degeneration and diabetic retinopathy.

The researchers are using dried wolfberries and examining their effects on the retina pigment epithelial cell layer.

"It's the only cell layer in the far back of the retina, and it provides a fundamental support to the whole retina, just like the base of a building," Lin said. "All of the nutrients pass through that cell layer."

By using type-2 diabetic mice, the researchers are studying the effects of

wolfberries on oxidative stress, one of the factors that occurs in diabetic retinopathy, which is a common complication of diabetes and the leading cause of blindness in American adults.

"Oxidative stress is known as cell impairment of the production of reactive oxygen," Lin said. "Cellular oxidative stress is involved in many human diseases, such as diabetes, vision impairment and blindness."

The researchers also looked at the endoplasmic reticulum, which is where the folding process of proteins occurs in a cell. When the accumulation of unfolded protein aggregates occurs persistently, the endoplasmic reticulum is under stress. Prolonged stress will eventually cause cell deaths, Lin said.

The in vitro and in vivo studies have shown that the wolfberry's phytochemicals protect the retinal pigment epithelial cells from hyperglycemia, or high glucose. The findings show that the fruit has local effects on oxidative stress, reactivates the enzyme AMPK and reduces endoplasmic reticulum stress.

"AMPK is a key enzyme in the balance of cell energy homeostasis," Lin said. "The outcome of the current research will lead to the development of dietary regimens in prevention of an eye disease."

The researchers are continuing to study wolfberries and their health benefits. Lin said wolfberries could be used as a dietary supplement, though the fruit isn't likely to be found in traditional U.S. food stores. He said consumers might find them in a Chinese food store or on the Internet.

The research is part of a fast-moving field called nutrigenomics, which studies the effects of food on gene expression and disease. Nutrients have been shown to affect gene expression, and by understanding the

roles of specific nutrients and how they might cause diseases, scientists could recommend specific foods for an individual based on his or her genetics.

At K-State, other researchers collaborated on the project: Denis Medeiros, professor and department head of human nutrition; Yu Jiang, research associate in human nutrition; Edlin Ortiz, junior in life sciences, Liberal; and Yunong Zhang, a former research assistant in human nutrition.

The research has been presented at the 2009 Experimental Biology conference and 2009 American Society of Cell Biology Conference. The project is funded by a grant from K-State's Center of Biomedical Research Excellence.

Provided by Kansas State University