

Free radicals in cornea may contribute to Fuchs dystrophy, most common cause of corneal transplants

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Scientists have found that free radicals (unstable molecules that cause the death of cells as the body ages) may also cause the damage in the eyes of patients with Fuchs Endothelial Corneal Dystrophy (FECD), a hereditary disease that is one of the most common reasons for corneal transplants worldwide.

The finding, published in the November 2010 [American Journal of Pathology](#), holds promise for early and preventative treatments for this disease, which impacts nearly four percent of the population over age 60.

"Our discovery is significant, because it gives us the first hope for slowing the progression of the disease," says Dr. Ula V. Jurkunas, the principal investigator of the study, who is a scientist at Schepens Eye Research Institute and a corneal surgeon at Massachusetts Eye and Ear Infirmary in Boston. "If we can identify how [free radicals](#) are involved in this and what antioxidants can fight them, we can create a regimen that can help protect the cornea," she adds. (Antioxidants are molecules such as vitamins or certain proteins that bind with and neutralize free radicals.)

FECD destroys cells in the endothelial or deepest layer of the cornea, which is the clear tissue that makes up the front portion of the eye. These endothelial cells are equipped with pumps that expel excess water from the cornea and keep it clear. Without these cells, the cornea swells and vision clouds, and, in the late stages, vision is completely blocked.

Because corneal endothelial cells do not regenerate themselves, the only effective treatment for Fuchs has been [corneal transplant](#), in which a surgeon removes the injured layer and replaces it with the donor [endothelium](#).

While scientists have made progress in identifying some genes that cause the disease, they have made little or no progress in defining the mechanisms at play.

As a surgeon who performs hundreds of transplants, Jurkunas began to believe that a free radical process might be part of what is happening within the Fuchs dystrophy-plagued cornea. Free radicals are unstable molecules released by the body, which destabilize other molecules through a process known as oxidization, which causes cell death. Antioxidants are known to bind with and neutralize free radicals.

To test the theory, Jurkunas and her colleagues took numerous tissue samples from patients undergoing corneal transplants and tested them for evidence of free radical oxidation and subsequent tissue damage.

In the significant majority of specimens, the scientists found that the level of antioxidants was less than normal (or down-regulated). They also found evidence of high rates of damage to the cells' DNA, which is particularly susceptible to free radicals.

According to Jurkunas, the next step is to identify the specific antioxidants that would neutralize the free radicals involved in the damage and, therefore, could prevent or block their destructive action.

What should patients do in the meantime? While no conclusions should be drawn from these early results, Jurkunas recommends that patients at risk for Fuchs eat a healthy diet rich in leafy green vegetables, such as broccoli and Brussels sprouts, take multivitamins and wear UV protection outdoors.

Provided by Schepens Eye Research Institute

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