Seeing the Light: LEDs as Treatment?
The same wavelength of light that destroys blood vessels in Visudyne treatments might, at lower energies, heal faltering retinal cells by boosting their mitochondrial ATP factories.

Using rats with methanol-induced retinal toxicity, Wisconsin scientists have brought this paradox to the fore—and raised the possibility of reversing retinal diseases without the need to identify key growth factors, cytokines or genes.

"The first event necessary for cells to do anything is to have the energy to do it," said the scientist leading the research, Harry T. Whelan, MD, professor of neurology at the Medical College of Wisconsin in Milwaukee. "So, while the input in this approach is light energy, the cell then makes of it what it needs to do its healing."

The 31/2-by-41/2-inch array of light-emitting diodes (LEDs), commissioned by NASA, now funded by the U.S. military, has been shown to heal diabetic ulcers, prevent chemotherapy-induced mouth ulcers and accelerate healing in sports injuries of Navy submariners.

The LEDs emit 670-nanometer light, the same near-infrared wavelength that activates verteporfin (Visudyne) to treat age-related macular degeneration. However, the energy is not aimed at a single spot, and the amount of light delivered per square centimeter is 4 joules compared with 50 joules for phototherapy laser.

In the rat ocular experiment (which was in the process of being published in the Proceedings of the National Academy of Sciences at EyeNet's press time), methanol was used to intoxicate rats. This produced the metabolite formic acid, which is toxic to the retinal cells by inhibiting cytochrome oxidase and, thus, the final step in the electron transport chain that produces ATP in the mitochondria.

The rats were given three light treatments at five, 25 and 50 hours after intoxication. Each treatment lasted two minutes and 24 seconds. Electoretinograms and, later, histologic exams at 72 hours showed nearly normal structure and function of photoreceptors and mitochondria after LED treatment, compared with deterioration in untreated rat retinas, Dr. Whelan said. (Ganglion cells were not studied.)

Moving the experimental evidence into the eye is important to Dr. Whelan's research sponsor, the Pentagon's Defense Advance Research and Projects Agency. Over the last decade, pilots and Special Forces troops have had an increase in eye injuries from increasingly sophisticated laser weapons.

But civilian ophthalmologists might want to begin testing LED light to boost retinal healing, Dr. Whelan suggested. Defects in mitochondrial function are suspected in retinal and optic nerve diseases, such as AMD, diabetic retinopathy and Leber's hereditary optic neuropathy, he noted.
HERE'S HOW THE NIR POWER LIGHT WORKS

REDUCES CARPAL TUNNEL PAIN by stimulating the body to produce endorphins and by decreasing irritation in nerve endings.

PROMOTES FASTER HEALING by improving circulation and increasing the production of two major healing enzymes.

CAN REDUCE INFLAMMATION OF THE MEDIAN NERVE by as much as 75% after just one use.

INCREASES BONE REPAIR SPEED by stimulating fibroblastic and osteoblastic proliferation.

RELAXES MUSCLES and muscle spasms by increasing levels of nitric oxide to the blood at the site of application.

DECREASES SWELLING by promoting lymphatic drainage.

ENHANCES THE IMMUNE SYSTEM by increasing the number of "killer" cells by up to 900%

RE-ENERGIZES CELLS by facilitating transport of essential nutrients across damaged cell walls.

ACCELERATES COLLAGEN PRODUCTION which is used by the body to build new tissue.