

## Healing Light



Experiments with light energy are making everyone happy: farmers, doctors, patients, and astronauts are all reaping the benefits. What began as a way to grow better crops has ended up being a way to help seriously ill patients recover faster. In this case, what's good for plants is also good for people.

It started with Light Emitting Diodes (LEDs) developed by NASA Marshall Space Flight Center in Alabama and Quantum

Devices, Inc., of Wisconsin. The scientists exposed plants aboard the Space Shuttle to the near-infrared light produced by LEDs. They found that the LEDs increased the energy produced in the mitochondria (energy compartments) of each cell. That meant the cells grew faster. Faster-growing plants are good news for farmers; the faster the plants grow, the sooner they can be harvested, processed, and sold.

Right about the same time, Quantum Devices scientists heard physicians discussing the use of laser therapy for their patients. While laser light did accelerate cell growth and healing in patients, there were some significant drawbacks. Lasers can cause tissues surrounding the treatment area to become overheated, they're big and expensive, limited in wavelength (color), and they're not very reliable, said Harry T. Whelan, MD, professor of pediatric neurology and director of hyperbaric medicine at the Medical College of Wisconsin. A light went off, so to speak, and Quantum approached Dr. Whelan about his concerns. Soon they were experimenting to see if using LED instead of laser therapy would improve the quality of treatment for patients.

"LED treatment has been a wonderful advancement," Dr. Whelan says. "LEDs don't heat the tissues the way lasers do; because LED uses longer wavelength (redder) near-infrared light, it penetrates the tissues deeper. And where lasers are more pinpointed in their delivery, LED can treat the entire body. That's useful for treating people with serious burns, crush injuries, and complications of cancer chemotherapy and radiation treatment, where large portions of the body are involved."

LED therapy has been used successfully with diabetic skin ulcers, burns, and severe oral sores caused by cancer treatment. The redder the light, the longer the wavelength, and the longer the wavelength, the more deeply it can penetrate body tissues, Dr. Whelan says. The near-infrared light rays produced by LED are longer than (and therefore superior to) lasers, and Dr. Whelan asserts that this improved therapy could extend to treating brain tumors and injuries. Animal experiments being conducted now direct LED through the head without the use of any surgery. When LED light is used to activate



light-sensitive chemotherapy drugs to destroy cancer, it is dubbed Photo Dynamic Therapy (PDT). LED light is otherwise used without drugs to stimulate normal cell chemicals for healing and tissue regeneration.

“LED reacts with cytochromes in the body,” says Dr. Whelan.

“Cytochromes are the parts of cells that respond to light and color. When cytochromes are activated, their energy levels go up and that stimulates tissue growth and regeneration. The potential to regenerate tissue, muscle, brain, and bone opens the door to helping people with diseases that previously had no hope of treatment.”



The good news about using LED therapy to speed healing made its way back to the space program. Muscle and bone atrophy are well documented in astronauts because microgravity slows the healing process and alters the function and structure of every cell’s mitochondria, Dr. Whelan says. The result is that wounds are slow to heal, and muscles and bones become weaker from time spent in space. The idea of using LED therapy with astronauts sounded appealing.

“Using an LED array to cover an astronaut may help prevent the effects of microgravity,” says Dr. Whelan. “LED therapy could also be used to help treat conditions that could arise in space that don’t respond to treatment because of those microgravity situations. A simple cut might heal faster with LED, but the benefits would be even more notable if an astronaut suffered a severe injury.”

Here on Earth, Dr. Whelan says that LED therapy can easily affect our entire population. “Not everyone may need to use LED treatments for themselves, but just about everyone has known someone with cancer or a severe injury,” he says. “Knowing that there is hope for diseases that used to have no treatment is good news for everyone.”

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