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Light that can cure you

Exciting new research provides doctors with an alternative treatment to drugs or surgery for ailments ranging from acne to Alzheimer's.

By Reed Karaim

Healing the human body with a beam of light sounds like something out of a classic Star Trek episode. But even Dr. McCoy never dreamed of the futuristic ways that today's doctors are finding to use different kinds of light in medicine.

Researchers are exploring everything from penetrating beams of light that seem to repair heart tissue after a heart attack to "light therapy" that appears to improve Alzheimer's patients' ability to sleep through the night. Doctors are remedying the side effects of cancer treatments, severe acne and other ailments just by shining high-intensity light in varying colors on the affected area.

In these ground-breaking therapies, light-emitting diodes, or LEDs, most often are usedto apply concentrated doses of light to patients. LEDs are not lasers, so tissue does not get hot, and the treatment is pain-free. "It represents a quantum leap in medicine," says Harry T. Whelan, M.D., who is a professor of neurology at the Medical College of Wisconsin and a leading researcher in the field. "It's a change from the standard medical models of drugs and surgery, where you are basically either poisoning or cutting the patient."
Light apparently works on human tissue at the cellular level, transferring energy to the mitochondria, which function as microscopic power plants, helping the body repair itself. Light also can speed up or slow down certain chemical processes in cells.

The secret to the many ways that light can be used in medicine lies in the varying wavelengths of different colors of light. "These are essentially the different colors of the rainbow, and each has a different effect on human tissue," says David Goldberg, M.D., director of Skin Laser & Surgery Specialists of New York & New Jersey, who has been doing research in the field for two decades.

Here's a survey of the bright new field of light treatment:

Near infrared light
The long wavelengths of near infrared light, next to red on the spectrum and invisible to the human eye, can penetrate deeply into human tissue. For that reason, it may be the light treatment with the most dramatic potential for revolutionizing medicine.

Working with patients at the Children's Hospital of Wisconsin, professor Whelan and his colleagues have used infrared light to treat "severe mucositis," oral sores that are a side effect of chemotherapy and radiation treatment and leave patients unable to either eat or drink. "We've essentially eliminated severe mucositis here in the ward," Whelan says.

Bigger applications could be ahead. Tests on animals have shown success reversing blindness by stimulating retinal cells in the eye. Animal studies also indicate that infrared light can help cut a heart attack's severity by up to 50% and repair tissue afterward.

Red light
Red light, which does not penetrate as deeply as near infrared, seems to help wounds heal more quickly. In addition, the light can be used to remove certain precancerous skin cells without scarring, Goldberg says.

But what many people may be most interested in is red light's ability to reverse aging. Used in conjunction with near infrared, the light promotes collagen formation, which smooths out wrinkled skin. "You're not going to take somebody who is 60 and turn them into a 20-year-old," Goldberg cautions, "but it is very clear that you can take people's skin and make them look younger and more vibrant."

Red light also has an anti-inflammatory effect and can kill bacteria, as can blue light. In fact, Goldberg has had success using red and blue light together to treat severe cases of acne. He says that light therapy "has revolutionized the treatment of skin."

Blue light
Besides its use as an antibacterial agent, blue light has a special ability to reset the biological clock. The reason seems to be tied to the thousands of years humans toiled almost completely outdoors. "We are blue-sky-sensitive creatures," says Mariana Figueiro, assistant professor at Rensselaer Polytechnic Institute's Lighting Research Center, based in Troy, N.Y.

Studies by Figueiro and others indicate "blue light boxes" are far more effective than full-spectrum sunlight boxes of equal intensity at fighting seasonal affective disorder, commonly known as the winter blues. Studies at Harvard Medical School in Boston and the Lighting Research Center also indicate that a dose of blue light, depending on when it is given, can increase alertness or help fight insomnia. In particular, Figueiro's studies show that exposure to blue light in the evening makes Alzheimer's patients more likely to sleep through the night.

Ultraviolet light
Ultraviolet light, which exists just below violet on the spectrum, can be used to keep bacteria and viruses from reproducing. A study by the Lighting Research Center is now underway in which the air being circulated through a Manhattan office and retail building is treated with UV light in the vents.. "It's potentially an efficient way to sterilize the air," says Andrew Bierman, who is a researcher at the center. UV light is being used in water treatment plants, and New York City is now building the world's largest UV treatment facility, which will be able to treat 2 billion gallons of water a day.