

Low level laser therapy is a promising, yet controversial, modality for hair loss.

By Alan J. Bauman, MD—Jan 2008

Although it may sound like science fiction to some, laser therapy is becoming a highly sought after treatment for patients with hair loss. Among cosmetic surgeons, dermatologists, age management professionals and holistic practitioners, cold lasers are a hot topic.

A noninvasive technology that assists with wound healing, pain control, ischemic events and numerous other conditions, low level laser therapy (or LLLT) is a promising, yet controversial, modality. It purports to stimulate hair follicles at the cellular level to regenerate weak or thinning hair through a process called photobiomodulation or photobiostimulation.

For the estimated 60 million men and women in the United States suffering from hair loss, LLLT may be the light at the end of the tunnel. Or is it just a false ray of hope? This question isn't easy to answer. Patients and the FDA have given lasers positive reviews for treating hair loss. However, people with hair loss may expect too much from the treatment.

When it comes to hair follicles, we know that what's dead is dead, and what's gone is gone. But if a treatment, such as laser therapy, can improve hair caliber by even just a small percentage, this can significantly affect hair volume and dramatically improve coverage of the scalp—even without large changes in density.

Tried and True Treatments

Finasteride and minoxidil remain the standard of care for the medical treatment of male hair loss. However, a recent survey of physicians from the International Society of Hair Restoration Surgery revealed that they're more apt to recommend laser therapy to their patients today than compared to just two years ago.

Most agree that LLLT is not a miracle cure. But physicians who have experience with LLLT believe patients benefit from the therapy either as a "stand-alone" treatment or when it's combined with traditional approaches. Some physicians also have reported accelerated wound healing in patients undergoing hair transplantation who have used LLLT in the perioperative period.

LLLT exerts its physiologic effects directly on the target cells through a mechanism of photobiostimulation or photobiomodulation. Today, it's well known that nonionizing, nonmutagenic levels of power in the infrared and/or near infrared visible wavelengths (typically 540 nm to 840 nm) of the electromagnetic spectrum can influence cellular metabolism. These effects, which are not due to heat, are mediated by a photochemical reaction that alters cell/organelle membrane permeability, leading to increased mRNA synthesis and cell proliferation, as well as the release of growth factors and cytokines.

Any laser that emits less than 400 mW power can deliver LLLT. Available in a range of wavelengths and power, semiconductor diodes lasers typically used for hair growth are in the range of 635 nm to 670 nm and emit less than 5 mW.

When LLLT Began

LLLT had its official beginnings in 1967 when Hungarian researcher Endre Mester, often credited as the "father" of modern laser therapy, wanted to test the mutagenicity of laser radiation in mice. After shaving the dorsal hair, he divided the mice into two groups and gave a laser treatment with a low-powered laser (694 nm) to one group. To his surprise, the hair on the treated group grew back more quickly than the untreated group.

Since this first demonstration of laser biostimulation, medical treatments with coherent (laser) and noncoherent (LED) light sources have passed through childhood and adolescence. This 40-year journey has included research sponsored by NASA and practitioners across the globe who have used LLLT for various purposes: to heal chronic wounds, sports injuries and carpal tunnel syndrome; reduce the pain of arthritis and neuropathies; and ameliorate damage from heart attacks, stroke, nerve injury and retinal toxicity.

Researchers from Harvard Medical School, the Harvard-MIT Division of Health Sciences and Technology, and Massachusetts General Hospital state that "in LLLT, the question is no longer whether light has biological effects but rather how energy from therapeutic lasers and LEDs works at the cellular and organism levels."

Because independent, well-controlled published studies on LLLT and hair growth are lacking, its use remains controversial. Nonetheless, the first peer-reviewed clinical study of LLLT treatment for hair loss was published in 2003 in the *International Journal of Cosmetic Surgery and Aesthetic Dermatology*.

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The researchers found that after six months of treatment with a hand-held laser unit, hair counts increased in the temporal area on average of 55 percent in women and 74 percent in men. In the vertex area, women saw a 65 percent improvement and men experienced a 120 percent improvement. Hair tensile strength also improved dramatically and was most noticeable in the vertex area for men (89 percent) and the temporal area for women (83 percent).

Physicians Robert Weiss, David McDaniel, Roy Gerone-mus and Margaret Weiss also presented their findings on light-emitting diode (LED) photomodulation as a treatment for hair loss at the American Society for Laser Medicine & Surgery conference in April 2005. McDaniel et al. found that gene expression in human dermal papilla cells exposed to certain wavelengths and treatment intervals was similar to that of cells treated with minoxidil. Specifically, increases in VEGF, HGF and MMP-2 were observed.

I believe LLLT and hair growth research provides fertile ground for well-controlled future studies, as we continue to learn how certain wavelengths, output power and treatment intervals affect hair follicle metabolism, hair growth and the hair loss process.

Because it's nonchemical, noninvasive and painless, LLLT is a desirable treatment for many people with hair loss, despite that 10 percent of patients seem to be nonresponders to the therapy.

Generally, miniaturizing areas that are "in transition" tend to stand a chance at more visible improvement or stabilization over time. For example, some notice an improvement in the texture and volume of their hair, without a noticeable change in density measurements. Many women have said their color or curl "holds" longer likely due to the improvement in hair caliber. Men notice that coverage often improves in thinning and miniaturized areas for the same reason. Receded hairlines and barren crowns, however, typically don't improve with LLLT.

Designing Treatment Plans

When prescribing a laser treatment plan for patients, be sure to manage their expectations so they understand what the treatment can realistically provide. Consider the standard medical treatments first. As I've stated, LLLT is not a miracle cure. It's important that patients realize that its effectiveness is limited and that it doesn't replace the tried-and-true treatments.

The second factor is compliance. Will patients come into the office for the treatment? Or will they have the discipline to be strictly compliant with an at-home unit when the results improve slowly and subtly over the course of many months? One clinical unit contains more than 100 separate uncollimated laser diodes, providing full coverage of the scalp during every minute of treatment. Hand-held devices deliver the laser "dose" over a much smaller surface area per minute. When the benefits are slow and subtle over time, the majority of hair loss patients, unfortunately, will have difficulty tracking their own results and/or staying motivated.

If the patient understands the potential mild benefits of laser therapy and the time required to undergo the treatments and results-tracking, there can be consensus between the doctor and patient to begin the therapy. At this time, be sure to document the patient's baseline status in hair coverage, density and caliber.

As part of our initial baseline assessment, we take a standard set of digital photos, using controlled lighting, distance and aperture settings. These global photos can be compared at various intervals during treatment. Density measurements and a map of the locations of miniaturized hair may also be documented. Typically, we follow patients every 90 days. Sometimes results are achieved quickly and for others, it may take a year to notice improvement.

Earlier treatment, via traditional or alternative means, is always the best. When the density is too low, or follicles have miniaturized down to microscopic vellous hairs or they've stopped producing hair altogether, no amount of laser therapy—or any noninvasive treatment—can regrow those areas.

Integrating a new therapy for patients is never easy. As new reliable research becomes available, the benefits and drawbacks of LLLT in treating hair loss will emerge. For now, educate yourself by doing Medline searches and reading textbooks, journal articles, scientific presentations and reliable websites. Make sure you clearly and openly communicate what is known (and unknown) about laser therapy with all of your patients.

For a list of references, go to advanceweb.com/healthyaging and click on the references toolbar.

Alan J. Bauman, MD, is the founder and medical director of Bauman Medical Group in Boca Raton, Fla.

He has spent more than 10 years treating patients who want to enhance, maintain or restore their hair, including eyebrows and eyelashes. Dr. Bauman advocates a multi-therapy approach to hair restoration, which includes FDA-approved medical treatments, laser therapy, follicular-unit micrografting hair transplantation and other modalities. Dr. Bauman is a diplomate of the American Board of Hair Restoration Surgery and a member of the International Society of Hair Restoration Surgery.

Disclosure: Dr. Bauman indicates that he's on the medical advisory board and the speaker's bureau of Sunetics Inc.

Patient Relations: 10 Questions to Anticipate

Patients, as well as doctors, have their doubts about the true benefit of LLLT as a treatment for hair loss. Managing patients' expectations from the beginning and tracking their results through the treatment regimen is the best way to guarantee their satisfaction and commitment to any prescribed treatment. The first step is having detailed knowledge of the natural progression of hereditary hair loss, which results in decreased hair quality and decreased hair density over time.

Here are 10 of the most common patient questions, which all doctors will need to answer, either during the consultation or the course of treatment.

1. How does laser therapy work? Laser therapy enhances hair growth by stimulating live, but weakened, follicles at the cellular level. It does not reactivate dead follicles.
2. Are all LLLT devices FDA-cleared? No. It's currently "buyer beware" when it comes to comparing medical devices that do not have FDA 510(k) market clearance.
3. Is laser therapy right for me? Laser therapy is effective for patients who want to improve weak or thinning hair. However, it may not work for areas of the scalp that are severely bald.
4. How soon should I expect to see results? This depends on how your physician tracks results. Density improve-

ments are often noted in 10 to 20 weeks using microscopy. Improvement in coverage can take six to 12 months. Remember also that slowing or stopping the hair loss process is a positive result.

5. What happens if I stop using it? Laser sessions will not cause permanent changes to the follicles. Therefore, to keep hair growing, patients must follow a regular treatment schedule.

6. Does it work for women too? Yes. In fact, laser therapy may be more effective for women because they typically have more hair.

7. How do I know it's working? Baseline photos and density measurements should be documented before starting any hair restoration regimen. Early results can be subtle, so careful tracking and follow-up is crucial. Patients should adhere to their prescribed treatment schedule and commit to interval follow-up visits to check their progress.

8. Is it an alternative to surgery? No. LLLT can affect hair growth, but only in live follicles. Therefore, it's a good option for patients with diffuse thinning or in combination with other treatments. But it will not reactivate dead follicles. Any areas where hair densities are very low are likely to require hair transplant surgery to restore significant coverage.

9. Can I do it at home? In addition to the in-office clinical laser hood units, three at-home consumer versions can be helpful for patients. Known as hand-held laser units, they include: Sunetics International's Laser Brush (\$395), Lexington's HairMax LaserComb (\$445) and Erchonia's THL-1 Hair Laser (\$2,499).

10. Should I use the hand-held unit every day? Studies on LLLT show that treatments with LLLT can be overdone. There is a biphasic dose response that adheres to the Arndt-Schultz Law: Weak stimuli excite; strong stimuli inhibit cellular processes. For each condition, it seems there is a therapeutic dose window. Overdoing it may produce little response, or worse, an inhibitory effect.