

Low-Level Laser Therapy (LLLT)

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The Cold Laser: A Newer Medical Treatment for Pattern Hair Loss

Laser light generated by low-powered (cold) lasers has recently come into use as a non-surgical hair restoration treatment for pattern hair loss. Hand-held "comb", "brush" or "cap" laser devices are marketed for use at home. Larger "hood" or "cap" devices are used in hair restoration clinics.

Laser light is not approved or recommended for treatment of hair loss due to any other cause. Click on [Hair Loss and Hair Restoration: Unraveling the Secrets of the Hair Cycle](#). If the cause of hair loss is questionable, you should see a physician hair restoration specialist for appropriate examination and diagnosis before using a LLLT laser. The use of lasers for medical purposes is not new. Lasers have been in use for medical purposes for many years and the physics, chemistry and biology of laser light interaction with human tissue are well documented. Medical uses range from surgery using high-powered lasers to stimulation of tissue repair. Use of laser light for treatment of hereditary hair loss is a newer application of laser technology. The "cold" lasers used for treatment of androgenetic alopecia deliver what is called low-level laser therapy (LLLT). The LLLT lasers are called "cold" because their light is absorbed by target tissue but does not heat the target tissue as occurs with lasers used to cut and remodel tissue.

The Mechanics of a Laser

The laser is a device for producing and emitting light of a very specific wavelength and power (wattage). The specificity (coherence) of wavelength is what makes lasers unique. The wavelength (color) of laser light and the wattage are selected for the specific purpose to be accomplished. Thus, lasers that emit narrow wavelengths of green, red, infrared, etc., are selected and paired with appropriate wattage for specific purposes. The laser light used for treatment of pattern hair loss is visible red light with wavelength of 630-670 nanometers and low power (wattage).

LLLT in Hair Restoration: How It Works

The interaction between laser light and living tissue is defined as photobiology. Photobiology can be subdivided into laser-tissue reactions defined as photochemistry and photophysics—that is, stimulation of chemical or physical reactions by laser light. The use of light of any wavelength for medical purposes is defined as phototherapy.

Why is visible red light in the narrow spectrum of 630-670 nanometers and low power crucial for treatment of pattern hair loss? The answer is: because red light in that narrow spectrum at low power is absorbed by hair follicle molecules critical to stimulating hair growth or regrowth. Absorption of light by the hair follicle molecules is essential in order for biological reaction to be stimulated in the molecules. If light is not absorbed, no photobiological reaction will occur. Why is visible red light in the narrow spectrum of 630-670 nanometers and low power crucial for treatment of pattern hair loss? The answer is: because red light in that narrow spectrum at low power is absorbed by hair follicle molecules critical to stimulating hair growth or regrowth. Absorption of light by the hair follicle molecules is essential in order for biological reaction to be stimulated in the molecules. If light is not absorbed, no photobiological reaction will occur. An accidental observation in laboratory mice in 1967 led to discovery that visible red laser light stimulates hair growth. A Hungarian scientist investigating the effect of laser light in treating skin cancer noticed that hair grew back more quickly on the skin of shaved mice treated with visible red laser light. Research has shown that visible red laser light in the 630-670 nanometer spectrum is absorbed by an intracellular enzyme (cytochrome c). Photobiological reactions stimulated in cytochrome c sends signals throughout cells of the hair follicle, stimulating enhanced gene activity, decreased apoptosis (gene-regulated cell death), and other changes that enhance cell activity and survival. LLLT does not stimulate hair regrowth in every person. If intracellular molecules are unable to absorb laser light, or unable to adequately respond to absorbed light, no stimulation of hair regrowth will occur. Experience has shown that stimulation of hair regrowth by LLLT is more likely to occur when hair loss is minimal to moderate, less likely when hair loss is major and/or long standing. Physician hair restoration specialists who use LLLT in a treatment plan for a patient's pattern hair loss have often noted that LLLT is more effective when used in conjunction with other medical therapies such as minoxidil or finasteride. Click on [Hair Restoration Medications: A Summary at a Glance](#). Some physician hair restoration specialists have reported that LLLT may enhance hair growth and reduce inflammation after hair transplantation. LLLT is not a "one time only" treatment for pattern hair loss. As with other medical therapies, treatment must be repeated at intervals to maintain hair regrowth results. Hair transplantation is the only permanent treatment for pattern hair loss. Click on [Surgical Hair Transplantation: Hair Transplant Surgery](#).

LLLT Devices

Hand-held LLLT devices for home use are marketed to the individual consumer. Larger LLLT devices are used in hair restoration clinics.

Hand-held LLLT devices for home use that are currently marketed on the World Wide Web and by advertising in print media include:

- The [HairMax LaserComb](#) has comb teeth and embedded lasers that deliver laser light to the scalp as the comb teeth part the hair. The HairMax Laser Comb has been cleared by the U.S. Food and Drug Administration (FDA) for marketing as a device to treat androgenetic alopecia. The HairMax Laser Comb is available by direct order or from a physician's office. The cost of a HairMax Laser Comb is several hundred dollars.
- The [X5 Laser](#) uses laser diodes to deliver light directly to the scalp. It is marketed as a cosmetic device and needs no additional FDA clearance for that use; status of clearance may change with completion of clinical studies that meet FDA guidelines. The X5 Laser is sold for about \$200.
- The [Sunetics Laser Hair Brush](#).

- The [Laser Cap](#) uses 224 lasers embedded in a wearable hat. It is available through physician offices, is marketed as a cosmetic device and needs no additional FDA clearance for that use. Status of clearance may change with completion of clinical studies that meet FDA guidelines. The Laser Cap is sold for about \$3000.

The potential consumer should compare hand-held devices not only for price, but also for features such as scalp coverage and power. LLLT devices used in a medical clinic are hoods much like a beauty salon hair dryer. The effectiveness and most advantageous use of LLLT for hair restoration has not yet been investigated in large, long-term, well-designed clinical trials. The first randomized, double-blind, multi-center trial, published in 2009, compared use of the HairMax Laser Comb with use of a "sham" device (Leavitt, M., Charles G, Heyman E, Michaels D. Clinical Drug Investigation. 2009; 29:283-292). The ISHRS takes no official stand on LLLT as a treatment for hair loss. On the one hand, it recognizes that some members strongly believe in LLLT as a complement to other treatments such as finasteride, minoxidil and hair transplantation. On the other hand, the ISHRS is aware that there is currently a lack of good support from large, well-designed double-blind studies to support the effectiveness of LLLT as a treatment for hair loss. Some ISHRS member physicians believe that this lack of evidence should make us cautious about recommending LLLT to our patients until more good scientific studies are performed. In summary, LLLT may be an appropriate treatment for some patients with male or female pattern hair loss. Patients should discuss this option with a qualified physician hair restoration specialist.