

Evidence-Based LED Phototherapy

Hair Restoration

IMPORTANT:

This document is intended as a reference guide only. It does not represent an official Dermalux treatment protocol or clinical guidelines. While the content is based on current evidence and supported by published literature, the summaries herein have not been formally approved by Dermalux as part of the official Dermalux protocol suite. Any clinical application of the information contained in this document should be used with caution and supported by clinical judgement.

1. Introduction



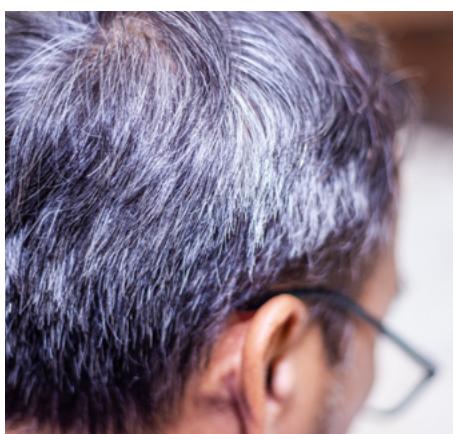
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Hair loss affects up to 80% of men and 50% of women by age 70, often with psychological and quality-of-life implications. Factors like stress, ageing, scalp health, and hormonal shifts all contribute to visible hair thinning and decreased hair quality.

LED photobiomodulation (PBM) is a *proven, non-invasive approach where the evidence demonstrates it stimulates hair follicle activity, improves scalp condition, and restores density. This guide provides a brief summary of the latest clinical evidence.

2. How LED Phototherapy Works for Hair

LED light, particularly in the red and near-infrared spectrum, is known to boost mitochondrial activity, increase adenosine triphosphate (ATP) production, reduce inflammation, and reactivates hair follicle stem cells.



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Red Light (633nm): Extends anagen phase, stimulates Wnt/β-catenin signalling, promotes density and shaft thickness.

Near-Infrared (830nm): Enhances scalp microcirculation and cellular regeneration.

Combination Therapy: Red + NIR LEDs produce optimal outcomes with minimal side effects.

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3. Clinical Evidence and Outcomes*

Figure 1 Key Clinical Studies Supporting LED Use in Hair Restoration

Study	Design	Wavelengths	Key Results	Reference
Kim et al. (2023)	Single-arm	Red + NIR	↑ Hair density & thickness (p<0.01), ↓ sebum, 91.8% patient improvement.	Indian J Dermatol
Yoon et al. (2020)	RCT, sham-controlled	Red	↑ Hair density by 41.9 hairs/cm ² ; ↑ thickness; well tolerated.	Medicine (Baltimore)
Lanzafame et al. (2014)	RCT	Red	↑ Hair count by 37% in women with AGA.	Lasers Surg Med
Lodi et al. (2021)	Prospective	Blue	↑ Hair density & shaft width in 90% of patients; safe & well tolerated.	Lasers Med Sci

*This is not an exhaustive list.

4. Summary and Clinical Applications

Growing clinical evidence confirms that LED phototherapy improves hair density, thickness, and scalp condition, with high tolerability and patient satisfaction. Dermalux's precision-engineered LED systems use wavelengths shown to activate hair follicle stem cells, support anagen phase re-entry, and improve hair aesthetics in both men and women.

For further reading, refer to:

- Guo et al. (2021) – Mechanisms of LED in hair growth. Lasers Med Sci.
- Avci et al. (2014) – Systematic review of LLLT in AGA. Lasers Surg Med.
- Torres & Lim (2021) – Photobiomodulation in alopecia. Photodermatol Photoimmunol Photomed.



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