DERMALUX ACADEMY

Evidence-Based LED Phototherapy
Pain Management

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

Pain is a significant global health burden, impacting millions and presenting a major barrier to quality of life. It is often associated with dermatological diseases, musculoskeletal conditions, post-surgical recovery, and more.

LED photobiomodulation (PBM) has emerged as a safe, non-invasive and effective approach to temporarily reduce pain, inflammation, and recovery time across multiple indications.

This guide presents leading clinical evidence supporting LED applications in pain management and highlights the role of Dermalux LED technology in achieving optimal outcomes.

The Dermalux Tri-Wave MD is CE marked as a Class IIa medical device for the treatment of dermatological and musculoskeletal conditions including acne, wound healing, psoriasis, and pain. It is also FDA cleared for the temporary relief of muscle and joint pain, arthritis, and stiffness.

2. How LED Phototherapy Works for Pain

LED phototherapy stimulates mitochondrial activity, enhances ATP production, and modulates inflammation to support pain relief and tissue repair.

Key wavelengths and benefits:

Red Light (633nm): Reduces inflammatory mediators and oxidative stress.

Near-Infrared (830nm): Penetrates deeper tissues, promotes circulation, and modulates pain perception.

Combination Therapy: Red and NIR light together provide synergistic effects for pain reduction and functional improvement.

3. Clinical Evidence and Outcomes[*]

Figure 1 Pain Reduction in Musculoskeletal Disorders

Study	Design	Key Findings	Reference
Leal-Junior et al. (2014)	RCT	Red/NIR LED significantly reduced nonspecific knee pain and improved joint function.	Lasers Med Sci, 2014
de Oliveira et al. (2022)	Systematic Review	Confirmed LED efficacy across common musculoskeletal conditions (e.g. shoulder, neck, back).	Eur J Phys Rehabil Med, 2022
Choi et al. (2023)	Observational	830nm LED improved hand stiffness and reduced pain in NSAID-refractory tenosynovitis.	J Rheum Dis, 2023

DERMALUX ACADEMY

Figure 2 Post-Surgical and Dermatological Pain

Study	Design	Key Findings	Reference
Kim et al. (2022)	RCT	830nm LED significantly reduced pain and improved healing after thyroidectomy.	Lasers Med Sci, 2022
Ye et al. (2025)	RCT	Post-blepharoplasty pain and swelling significantly reduced with LED therapy.	Aesthetic Plast Surg, 2025
Zhang et al. (2022)	Narrative Review	Summarised mechanisms of LED-induced pain relief including inflammation modulation and neuronal inhibition.	Lasers Med Sci, 2022

Figure 3 Pain in Dermatological Conditions

Study	Design	Key Findings	Reference
Kotewicz et al. (2024a, 2024b)	Observational	Up to 50% of psoriasis patients reported mild–moderate pain; NRS, SF-MPQ-2 and DLQI confirmed LED-associated improvements.	J Clin Med, 2024
González-Muñoz et al. (2023)	Review	PBM therapy (incl. LED) effective across dermatology and inflammation-related pain conditions.	Healthcare, 2023
Misery et al. (2017)	Survey	25.7% of skin-related pain is chronic; LED proposed as a viable adjunct for symptom relief.	Acta Derm Venereol,

*This is not an exhaustive list.

4. Summary and Clinical Applications

A growing body of evidence supports LED phototherapy as a clinically validated and well-tolerated solution for pain reduction across a range of medical and aesthetic indications. Dermalux LED systems, delivering precise Red and NIR light, offer a targeted approach for effective temporary pain relief, improving quality of life, recovery, and patient satisfaction.

Validated pain measurement tools used in LED studies include:

- Numerical Rating Scale (NRS)
- Visual Analogue Scale (VAS)
- Brief Pain Inventory (BPI)
- Short-Form McGill Pain Questionnaire (SF-MPQ-2)

For further reading, refer to:

- Cheng et al. (2021) – Mechanisms and Pathways of Pain Photobiomodulation The Journal of Pain. 22(7):763–777.
- Jumbo et al. (2020) – Validation of BPI-SF and SF-MPQ-2 in Musculoskeletal Pain Arch Bone Jt Surg. 8(2):131–141.
- Garg et al. (2020) – Review of Pain Evaluation Tools in Chronic Conditions Eur Spine J. 29(3):503–518.

For training, access Dermalux Academy resources or contact us for expert guidance.

DLX-084-1.0_EN