

# The Annals of Laser Therapy Research

## Providing Expert Analysis, Commentary & Discussion of The Laser Therapy Institute

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**PBM? Do you have any scientific references for your claims?**

By Jan Tunér

Not too seldom, non-believers in PBM will ask for references, having difficulties in accepting what you say. Providing such references can take time and you may not be too used to collect them or to know where to find them. Below, then, is a brief selection of recent studies. First, there is a “short-list” of PMIDs. Copy, paste and enjoy!

[PMID:28070154](#), [PMID:28748217](#), [PMID: 21172691](#), [PMID: 24049929](#), [PMID: 28580494](#), [PMID: 19913903](#), [PMID: 27898256](#), [PMID: 28337885](#), [PMID: 27639607](#), [PMID: 27034111](#), [PMID: 22169831](#), [PMID: 28538060](#), [PMID: 19708800](#), [PMID: 28145397](#), [PMID: 28688677](#), [PMID: 24725989](#), [PMID: 28292696](#), [PMID: 26748691](#), [PMID: 27543213](#).

### Mechanisms

de Freitas LF, Hamblin MR. Proposed Mechanisms of Photobiomodulation or Low-Level Light Therapy. IEEE J Sel Top Quantum Electron. 2016 May-Jun;22(3). [PMID:28070154](#).

Hamblin MR. Mechanisms and applications of the anti-inflammatory effects of photobiomodulation. AIMS Biophys. 2017;4(3):337-361. [PMID:28748217](#).

Chung H, Dai T, Sharma SK, Huang YY, Carroll JD, Hamblin MR. The nuts and bolts of low-level laser (light) therapy. Ann Biomed Eng. 2012 Feb;40(2):516-33. [PMID: 22045511](#).

Hashmi JT, Huang YY, Osmani BZ, Sharma SK, Naeser MA, Hamblin MR. Role of low-level laser therapy in neurorehabilitation. PM R. 2010 Dec;2(12 Suppl 2):S292-305. [PMID: 21172691](#).

Avci P, Gupta A, Sadasivam M, Vecchio D, Pam Z, Pam N, Hamblin MR. Low-level laser (light) therapy (LLLT) in skin: stimulating, healing, restoring. Semin Cutan Med Surg. 2013 Mar;32(1):41-52. [PMID: 24049929](#).

### Carpal tunnel

Li ZJ, Wang Y, Zhang HF, Ma XL, Tian P, Huang Y. Effectiveness of low-level laser on carpal tunnel syndrome: A meta-analysis of previously reported randomized trials. Medicine (Baltimore). 2016 Aug;95(31):e4424. [PMID: 27495063](#).

Bekhet AH, Ragab B, Abushouk AI, Elgebaly A, Ali OI. Efficacy of low-level laser therapy in carpal tunnel syndrome management: a systematic review and meta-analysis. Lasers Med Sci. 2017 Aug;32(6):1439-1448. [PMID: 28580494](#).

Barbosa RI, Fonseca Mde C, Rodrigues EK, Tamanini G, Marcolino AM, Mazzer N, Guirro RR, MacDermid J. Efficacy of low-level laser therapy associated to orthoses for patients with carpal

tunnel syndrome: A randomized single-blinded controlled trial. *J Back Musculoskelet Rehabil.* 2016 Aug 10;29(3):459-66. [PMID: 26444330](#).

## **Pain**

Huang Z, Ma J, Chen J, Shen B, Pei F, Kraus VB. The effectiveness of low-level laser therapy for nonspecific chronic low back pain: a systematic review and meta-analysis. *Arthritis Res Ther.* 2015 Dec 15;17:360. [PMID: 26667480](#).

Cavalcanti MF, Silva UH, Leal-Junior EC, Lopes-Martins RA, Marcos RL, Pallotta RC, Diomedede F, Trubiani O, De Isla N, Frigo L. Comparative Study of the Physiotherapeutic and Drug Protocol and Low-Level Laser Irradiation in the Treatment of Pain Associated with Temporomandibular Dysfunction. *Photomed Laser Surg.* 2016 Dec;34(12):652-656. [PMID: 27898256](#).

Chow RT, Johnson MI, Lopes-Martins RA, Bjordal JM. Efficacy of low-level laser therapy in the management of neck pain: a systematic review and meta-analysis of randomised placebo or active-treatment controlled trials. *Lancet.* 2009 Dec 5;374(9705):1897-908. [PMID: 19913903](#).

Jang H, Lee H. Meta-analysis of pain relief effects by laser irradiation on joint areas. *Photomed Laser Surg.* 2012 Aug;30(8):405-17. [PMID: 22747309](#).

Javed F, Kellesarian SV, Romanos GE. Role of diode lasers in oro-facial pain management. *J Biol Regul Homeost Agents.* 2017 Jan-Mar;31(1):153-155. [PMID: 28337885](#).

Kahraman SA, Cetiner S, Strauss RA. The Effects of Transcutaneous and Intraoral Low-Level Laser Therapy After Extraction of Lower Third Molars: A Randomized Single Blind, Placebo Controlled Dual-Center Study. *Photomed Laser Surg.* 2017 Mar 14. [PMID: 28294694](#).

Shukla D, Muthusekhar MR. Efficacy of low-level laser therapy in temporomandibular disorders: A systematic review. *Natl J Maxillofac Surg.* 2016 Jan-Jun;7(1):62-66. [PMID: 28163481](#).

Fernandes GA, Araújo Júnior RB, Lima AC, Gonzaga IC, de Oliveira RA, Nicolau RA. Low-intensity laser (660 NM) has analgesic effects on sternotomy of patients who underwent coronary artery bypass grafts. *Ann Card Anaesth.* 2017 Jan-Mar;20(1):52-56. [PMID: 28074796](#).

de Andrade AL, Bossini PS, Parizotto NA. Use of low level laser therapy to control neuropathic pain: A systematic review. *J Photochem Photobiol B.* 2016 Nov;164:36-42. [PMID: 27639607](#).

## **Sports Medicine**

de Paiva PR, Tomazoni SS, Johnson DS, Vanin AA, Albuquerque-Pontes GM, Machado CD, Casalechi HL, de Carvalho PT, Leal-Junior EC. Photobiomodulation therapy (PBMT) and/or cryotherapy in skeletal muscle restitution, what is better? A randomized, double-blinded, placebo-controlled clinical trial. *Lasers Med Sci.* 2016 Dec;31(9):1925-1933. [PMID: 27624781](#).

Lanferdini FJ, Bini RR, Baroni BM, Klein KD, Carpes FP, Vaz MA. Low-Level Laser Therapy Improves Performance and Reduces Fatigue in Competitive Cyclists. *Int J Sports Physiol Perform.* 2017 Apr 19:1-27. [PMID: 28422520](#).

Larkin-Kaiser KA, Christou E, Tillman M, George S, Borsa PA. Near-infrared light therapy to attenuate strength loss after strenuous resistance exercise. *J Athl Train.* 2015 Jan;50(1):45-50. [PMID: 25397864](#).

Takenori A, Ikuhiro M, Shogo U, Hiroe K, Junji S, Yasutaka T, Hiroya K, Miki N. Immediate pain relief effect of low level laser therapy for sports injuries: Randomized, double-blind placebo clinical trial. *J Sci Med Sport*. 2016 Dec;19(12):980-983. [PMID: 27034111](#).

Ferraresi C, Huang YY, Hamblin MR. Photobiomodulation in human muscle tissue: an advantage in sports performance? *J Biophotonics*. 2016 Dec;9(11-12):1273-1299. [PMID: 27874264](#).

Tomazoni SS, Leal-Junior EC, Pallotta RC, Teixeira S, de Almeida P Lopes-Martins RÁ. Effects of photobiomodulation therapy, pharmacological therapy and physical exercise as single and/or combined treatment on the inflammatory response induced by experimental osteoarthritis. *Lasers Med Sci*. 201 Jan;32(1):101-108. [PMID: 27726040](#).

### **Arthritis**

Alfredo PP, Bjordal JM, Dreyer SH, Meneses SR, Zaguetti G, Ovanessian V, Fukuda TY, Junior WS, Lopes Martins RÁ, Casarotto RA, Marques AP. Efficacy of low level laser therapy associated with exercises in knee osteoarthritis: a randomized double-blind study. *Clin Rehabil*. 2012 Jun;26(6):523-33. [PMID: 22169831](#).

Wang P, Liu C, Yang X, Zhou Y, Wei X, Ji Q, Yang L, He C. Effects of low-level laser therapy on joint pain, synovitis, anabolic, and catabolic factors in a progressive osteoarthritis rabbit model. *Lasers Med Sci*. 2014 Nov;29(6):1875-85. [PMID: 22169831](#).

Alghadir A, Omar MT, Al-Askar AB, Al-Muteri NK. Effect of low-level laser therapy in patients with chronic knee osteoarthritis: a single-blinded randomized clinical study. *Lasers Med Sci*. 2014 Mar;29(2):749-55. [PMID: 23912778](#).

### **Nerve Function and Repair**

Mohajerani SH, Tabeie F, Bemanali M, Tabrizi R. Effect of Low-Level Laser and Light-Emitting Diode on Inferior Alveolar Nerve Recovery After Sagittal Split Osteotomy of the Mandible: A Randomized Clinical Trial Study. *J Craniofac Surg*. 2017 Jun;28(4):e408-e411. [PMID: 28538060](#).

Pol R, Gallesio G, Riso M, Ruggiero T, Scarano A, Mortellaro C, Mozzati M. Effects of Superpulsed, Low-Level Laser Therapy on Neurosensory Recovery of the Inferior Alveolar Nerve. *J Craniofac Surg*. 2016 Jul;27(5):1215-9. [PMID: 27391492](#).

Byrnes KR, Waynant RW, Ilev IK, Wu X, Barna L, Smith K, Heckert R, Gerst H, Anders JJ. Light promotes regeneration and functional recovery and alters the immune response after spinal cord injury. *Lasers Surg Med*. 2005 Mar;36(3):171-85. [PMID: 15704098](#).

Paula AA, Nicolau RA, Lima Mde O, Salgado MA, Cogo JC. Low-intensity laser therapy effect on the recovery of traumatic spinal cord injury. *Lasers Med Sci*. 2014 Nov;29(6):1849-59. [PMID: 24858233](#).

Rochkind S, Drory V, Alon M, Nissan M, Ouaknine GE. Laser phototherapy (780 nm), a new modality in treatment of long-term incomplete peripheral nerve injury: a randomized double-blind placebo-controlled study. *Photomed Laser Surg*. 2007 Oct;25(5):436-42. [PMID: 17975958](#).

Medalha CC, Di Gangi GC, Barbosa CB, Fernandes M, Aguiar O, Faloppa F, Leite VM, Renno AC. Low-level laser therapy improves repair following complete resection of the sciatic nerve in rats. *Lasers Med Sci*. 2012 May;27(3):629-35. [PMID: 22009383](#).

### **Tendinitis**

Tumilty S, Munn J, McDonough S, Hurley DA, Basford JR, Baxter GD. Low level laser treatment of tendinopathy: a systematic review with meta-analysis. *Photomed Laser Surg.* 2010 Feb;28(1):3-16. [PMID: 19708800](#).

Haslerud S, Magnussen LH, Joensen J, Lopes-Martins RA, Bjordal JM. The efficacy of low-level laser therapy for shoulder tendinopathy: a systematic review and meta-analysis of randomized controlled trials. *Physiother Res Int.* 2015 Jun;20(2):108-25. [PMID: 25450903](#).

Clijisen R, Brunner A, Barbero M, Clarys P, Taeymans J. Effects of low-level laser therapy on pain in patients with musculoskeletal disorders. A systemic review and meta-analysis. *Eur J Phys Rehabil Med.* 2017 Jan 30. [Epub ahead of print]. [PMID: 28145397](#).

## **Lymphology**

Smoot B, Chiavola-Larson L, Lee J, Manibusan H, Allen DD. Effect of low-level laser therapy on pain and swelling in women with breast cancer-related lymphedema: a systematic review and meta-analysis. *J Cancer Surviv.* 2015 Jun;9(2):287-304 2016 Dec;31(9):1925-1933. [PMID: 25432632](#).

Li K, Zhang Z, Liu NF, Feng SQ, Tong Y, Zhang JF, Constantinides J, Lazzeri D, Grassetti L, Nicoli F, Zhang YX. Efficacy and safety of far infrared radiation in lymphedema treatment: clinical evaluation and laboratory analysis. *Lasers Med Sci.* 2017 Apr;32(3):485-494. [PMID: 28127644](#).

Carati CJ, Anderson SN, Gannon BJ, Piller NB. Treatment of postmastectomy lymphedema with low-level laser therapy: a double blind, placebo-controlled trial. *Cancer.* 2003 Sep 15;98(6):1114-22. Erratum in: *Cancer.* 2003 Dec 15;98(12):2742. [PMID: 12973834](#).

## **Oncology**

Zecha JA, Raber-Durlacher JE, Nair RG, Epstein JB, Sonis ST, Elad S, Hamblin MR, Barasch A, Migliorati CA, Milstein DM, Genot MT, Lansaat L, van der Brink R, Arnabat-Dominguez J, van der Molen L, Jacobi I, van Diessen J, de Lange J, SmeeleLE, Schubert MM, Bensadoun RJ. Low level laser therapy/photobiomodulation in the management of side effects of chemoradiation therapy in head and neck cancer: part 1: mechanisms of action, dosimetric, and safety considerations. *Support Care Cancer.* 2016 Jun;24(6):2781-92. [PMID: 26984240](#).

Bezinelli LM, de Paula Eduardo F, da Graça Lopes RM, Biazevic MG, de Paula Eduardo C, Correa L, Hamerschlak N, Michel-Crosato E. Cost-effectiveness of the introduction of specialized oral care with laser therapy in hematopoietic stem cell transplantation. *Hematol Oncol.* 2014 Mar;32(1):31-9. doi: 10.1002/hon.2050. [PMID: 23625880](#).

Antunes HS, Schluckebier LF, Herchenhorn D, Small IA, Araújo CM, Viégas CM, Rampini MP, Ferreira EM, Dias FL, Teich V, Teich N, Ferreira CG. Cost-effectiveness of low-level laser therapy (LLLT) in head and neck cancer patients receiving concurrent chemoradiation. *Oral Oncol.* 2016 Jan;52:85-90. [PMID: 26559740](#).

Antunes HS, Herchenhorn D, Small IA, Araújo CMM, Viégas CMP, de Assis Ramos G, Dias FL, Ferreira CG. Long-term survival of a randomized phase III trial of head and neck cancer patients receiving concurrent chemoradiation therapy with or without low-level laser therapy (LLLT) to prevent oral mucositis. *Oral Oncol.* 2017 Aug;71:11-15. [PMID: 28688677](#).

Palma LF, Gonnelli FAS, Marcucci M, Dias RS, Giordani AJ, Segreto RA, Segreto HRC. Impact of low-level laser therapy on hyposalivation, salivary pH, and quality of life in head and neck cancer patients post-radiotherapy. *Lasers MedSci.* 2017 May;32(4):827-832. [PMID: 28258315](#).

Epstein JB, Raber-Durlacher JE, Lill M, Linhares YP, Chang J, Barasch A, Slief RI, Geuke M, Zecha JA, Milstein DM, Tzachanis D. Photobiomodulation therapy in the management of chronic oral graft-versus-host disease. *Support Care Cancer*. 2017 Feb;25(2):357-364. [PMID: 27655559](#).

### **Aphthous Stomatitis**

Suter VGA, Sjölund S, Bornstein MM. Effect of laser on pain relief and wound healing of recurrent aphthous stomatitis: a systematic review. *Lasers Med Sci*. 2017 May;32(4):953-963. [PMID: 28345122](#).

Albrektson M, Hedström L, Bergh H. Recurrent aphthous stomatitis and pain management with low-level laser therapy: a randomized controlled trial. *Oral Surg Oral Med Oral Pathol Oral Radiol*. 2014 May;117(5):590-4. [PMID: 24725989](#).

### **Bone regeneration**

Santinoni CD, Oliveira HF, Batista VE, Lemos CA, Verri FR. Influence of low-level laser therapy on the healing of human bone maxillofacial defects: A systematic review. *J Photochem Photobiol B*. 2017 Apr;169:83-89. [PMID: 28292696](#).

Zein R, Selting W, Benedicenti S. Effect of Low-Level Laser Therapy on Bone Regeneration During Osseointegration and Bone Graft. *Photomed Laser Surg*. 2017 Jul 21. [PMID: 28742438](#).

Ferreira FN, Gondim JO, Neto JJ, Dos Santos PC, de Freitas Pontes KM, Kurita LM, de Araújo MW. Effects of low-level laser therapy on bone regeneration of the midpalatal suture after rapid maxillary expansion. *Lasers Med Sci*. 2016 Jul;31(5):907-13. [PMID: 27056702](#).

Abd-Elaal AZ, El-Mekawii HA, Saafan AM, El Gawad LA, El-Hawary YM, Abdelrazik MA. Evaluation of the effect of low-level diode laser therapy applied during the bone consolidation period following mandibular distraction osteogenesis in the human. *Int J Oral Maxillofac Surg*. 2015 Aug;44(8):989-97. [PMID: 25979190](#).

### **Wound Healing**

Tchanque-Fossuo CN, Ho D, Dahle SE, Koo E, Li CS, Isseroff RR, Jagdeo J. A systematic review of low-level light therapy for treatment of diabetic foot ulcer. *Wound Repair Regen*. 2016 Mar;24(2):418-26. [PMID: 26748691](#).

Mathur RK, Sahu K, Saraf S, Patheja P, Khan F, Gupta PK. Low-level laser therapy as an adjunct to conventional therapy in the treatment of diabetic foot ulcers. *Lasers Med Sci*. 2017 Feb;32(2):275-282. [PMID: 27896528](#).

Ustaoglu G, Ercan E, Tunali M. Low-Level Laser Therapy in Enhancing Wound Healing and Preserving Tissue Thickness at Free Gingival Graft Donor Sites: A Randomized, Controlled Clinical Study. *Photomed Laser Surg*. 2017 Apr;35(4):223-230. [PMID: 28092488](#).

Ribeiro BG, Alves AN, Dos Santos LA, Cantero TM, Fernandes KP, Dias Dda S, Bernardes N, De Angelis K, Mesquita-Ferrari RA. Red and Infrared Low-Level Laser Therapy Prior to Injury with or without Administration after Injury Modulate Oxidative Stress during the Muscle Repair Process. *PLoS One*. 2016 Apr 15;11(4):e0153618. [PMID: 27082964](#).

Al-Watban FA. Laser therapy converts diabetic wound healing to normal healing. Photomed Laser Surg. 2009 Feb;27(1):127-35. [PMID: 19193104](#).

### **Neuralgia**

Knapp DJ. Postherpetic neuralgia: case study of class 4 laser therapy intervention. Clin J Pain. 2013 Oct;29(10):e6-9. [PMID: 24384987](#).

Chen YT, Wang HH, Wang TJ, Li YC, Chen TJ. Early application of low-level laser may reduce the incidence of postherpetic neuralgia (PHN). J Am Acad Dermatol. 2016 Sep;75(3):572-577. [PMID: 27543213](#).

Spanemberg JC, López López J, de Figueiredo MA, Cherubini K, Salum FG. Efficacy of low-level laser therapy for the treatment of burning mouth syndrome: a randomized, controlled trial. J Biomed Opt. 2015 Sep;20(9):098001. [PMID: 26359814](#).

