BY ERCHONIA

Lunula Laser™

Have Beautiful Feet Again

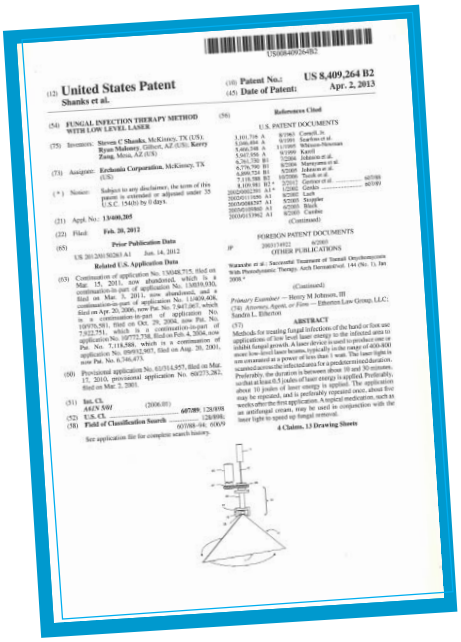
The Lunula Laser is the 1st and only non-thermal FDA Market Cleared laser device for the temporary increase of clear nail for patients with Onychomycosis.

THE COMMITMENT TO RESEARCH

Since 1996, Erchonia, the manufacturer of Lunula, has been committed to fully elucidating the medical utility of low level laser therapy through rigorous clinical studies. For almost 2 decades, Erchonia has studied the clinical utility of low level laser devices for the treatment of numerous medical ailments. Their recent device, Lunula, looks to revolutionize the way the medical community targets onychomycosis.

Lunula has been markedly studied – from the early in-vitro analysis to the extensive in-vivo studies – and its clinical utility to target toenail fungus has been substantiated. The unique dual-diode approach of Lunula effectively targets the causative infectious agent while fortifying the body's natural defense mechanisms. This multifaceted approach is the first of its kind, providing patients with a truly effective, yet safe, option to target onychomycosis.

As you will quickly learn, Lunula is supported by an unwavering clinical foundation of both histological and clinical evidence that upholds the viability of this approach and ensures an effective option for your patients suffering with onychomycosis. In fact, Lunula is so unique, Erchonia has filed multiple method and device patents specific to Lunula.



(12) **United States Patent**
Shanks et al.

(10) **Patent No.: US 8,409,264 B2**
(45) **Date of Patent: Apr. 2, 2013**

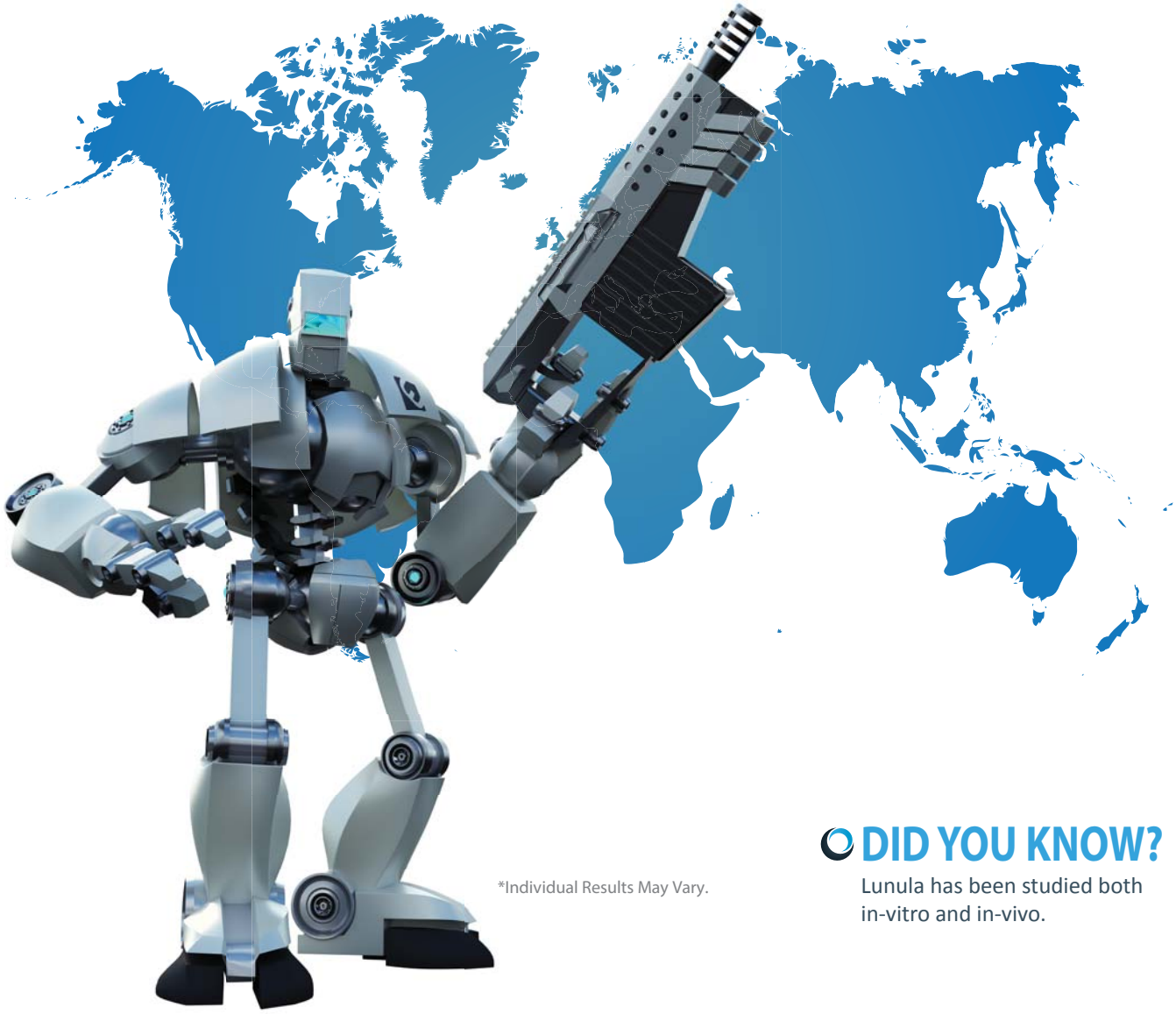
(54) **FUNGAL INFECTION THERAPY METHOD WITH LOW LEVEL LASER**

US PAT 8,409,264
Fungal Infection
Therapy Method
with Low Level Laser

US PAT 6,013,096; US PAT 6,746,473;US PAT 8,409,264; US PAT 8,814,924; US PAT 8,097,029; US PAT 7,118,588; US PAT 7,947,067; US PAT 7,922,751 and several U.S. and International Patents Pending.

LUNULA SAFELY TARGETS TOENAIL FUNGUS IN AS LITTLE AS FOUR 12-MINUTE PAINLESS TREATMENTS

Lunula's clinical utility to target onychomycosis has been substantiated by independent clinical investigations. The European study consisted of 320 patients (2320 toes) subject to laser irradiation at 405nm and 635nm for twelve minutes at weekly intervals for four weeks. The United States study consisted of 54 great toenails subject to laser irradiation at 405nm and 635nm for twelve minutes at weekly intervals for four weeks. This study was used to obtain the Lunula Laser 510(k) FDA market clearance. Sixty seven per cent (67%) of all study treated toenails evaluated in this study met the study individual toenail success criteria. The average clear nail growth was an increase in 6.18mm.* Equally important, the clinical responses observed in all four trials were achieved without a single adverse event.



*Individual Results May Vary.

DID YOU KNOW?

Lunula has been studied both in-vitro and in-vivo.

HOW THE COMPETITION STACKS UP TO LUNULA

	Lunula Laser U.S. Clinical Study	Lunula Laser European Clinical Study	Pinpoint	Laser Genesis Plus	Cool Breeze	Noveon (Normir)	Podylas 30′
Wavelength(s) Used	635/405nm	635/405nm	1064nm		1320nm	870/930nm	1064nm
Non-Thermal	YES	YES	NO	NO	NO	NO	NO
Physical Contact with Toe	NO	NO	YES	YES	YES	YES	YES
Required Debridement of Nails	NO	NO	YES	YES	YES	YES	YES
Treatment Spot Size	28.62cm2	28.62cm2	2-10mm	2-10mm	2-10mm	2-10mm	2-10mm
Complete Effective Treatment Coverage	YES	YES	NO	NO	NO	NO	NO
Treatment Time	12 min/ 5 toes	12 min/ 5 toes	4.5 min/ toenail*	4.5 min/ toenail*	4.5 min/ toenail*	4.5 min/ toenail*	4 min/ toenail*
Number of Treatments	4	4	4	4	~3	4	4
Application of Topical Antifungal to Toes	NO	NO	YES	YES	YES	YES	YES
Toes Studied	54	2320	17	N/A	N/A	26	N/A
Mean mm Nail Clear Nail at 3 Months	6.18	N/A	3.7	N/A	N/A	Not Reported	N/A
Percent of Subjects Showing Improvement at 3 Months	67%	N/A	71.4	N/A	N/A	N/A	N/A

*Not including potential debridement time.

1. Zang K, et al. Efficacy of a dual-diode low-level laser device for the treatment of Onychomycosis.
2. Sullivan Robert. Erchonia Lunula Laser Therapy (Cold Laser) in the Treatment Onychomycosis.
3. Harris DM, J Strisower, B McDowell. Pulsed laser treatment for toenail fungus. SPIE Proceedings 7161A121, 2009.
4. Landsman AS, Robbins AH, Angelini PF, Wu CC, Cook J, Oster M, Bornstein ES. Treatment of mild, moderate and severe onychomycosis using 870- and 930-nm light exposure. JAPMA;100(3):166-177.
5. Dow H. Onychomyscosis and nail dystrophy treated with the PinPointe Footlaser. Podiatry Now Magazine, June 2011.

ORAL MEDICATIONS

The limitations and risks of oral anti-fungal medications have been well documented. First, treatment of the body's most distal region – the toes - with an oral anti-fungal medication is often greeted with non-response or high rate of recurrence due to limited drug bioavailability routinely caused by insufficient blood flow. Next, the infectious agent is a eukaryote, and therefore, shares structural and biochemical similarities with our body's eukaryotic cell. As a result, our own important biochemical pathways can be negatively affected by oral anti-fungals. Although quite rare, hepatotoxicity has been reported in patients taking oral anti fungal medication. To mitigate the risk of liver complications, patients with specific pre-existing medical conditions cannot be prescribed oral anti-fungal medications, ***but for those patients who are taking anti-fungals, they must undergo routine liver function tests throughout the treatment course.*** Non-response, high-rate of recurrence, limited to certain patients, and serious risk of adverse events – these represent the drawback of oral anti-fungal medications.

HISTOLOGY - LUNULA MECHANISM OF ACTION

LunulaLaser is a dual-diode, low-level laser device that delivers a multifaceted device to target onychomycosis (OM). Lunulalaser follows the principles of photochemistry, a science that explores light's effect on cell function and behavior. The photochemical mechanism enables Lunulalaser to give a direct, non-contact treatment that produces no macroscopic sensation: no heating, tingling, burning. The mechanism of photo-chemistry is likened to the agonist effect of a drug, which describes the use of a certain molecule to start a secondary cascade. Laser therapy uses photonic energy to modulate secondary cellular reactions without the patient feeling the device working.

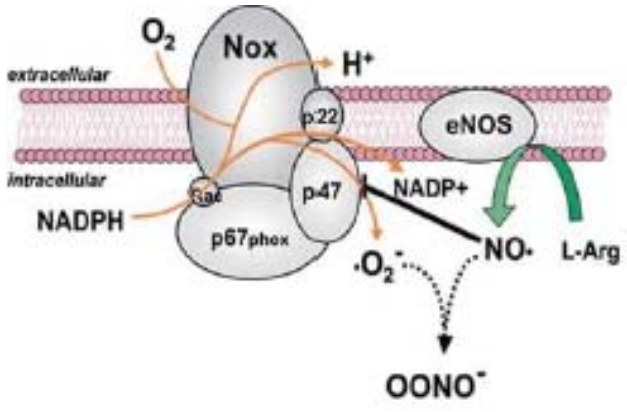
LunulaLaser impressive clinical response stems from its two therapeutic wavelengths: 405 nm (violet) and 635 nm (red). Each wavelength performs a very specific function to provide a comprehensive solution for OM. The manner in which the wavelengths are delivered represents an innovative and proprietary feature of LunulaLaser. Lunula administers the laser as a line-generated beam, which maximizes the treatment surface area. The fungal pathogen may not only affect multiple toes, but also may be found deep within a dystrophic nail or along the nail bed and root. The line-generated beam ensures that, regardless of where the fungal pathogen resides, an effective treatment will be administered.

405nm (VIOLET)

Violet has been demonstrated to have an antimicrobial effect by upregulating the production of Reactive Oxygen Species (ROS). leading to the generation of hydrogen peroxide, hypochlorous acid and hydroxyl radicals. When applied concurrent-ly, the combined antimicrobial and biostimulative effects appear to provide a therapeutically beneficial combination, as demonstrated by the mean percent changes in clarity. A potential photo-target for the 405 nm wavelength is also a system responsible for catalyzing the generation of ROS, nicotinamide adenine dinucleotide phosphate oxidase (NOX). NOX transfers electrons from cytosolic NADPH to flavin adenine dinucleotide (FAD), then to extracellular molecular oxygen to generate super-oxide. The third and fifth trans-membrane domains of NOX bind two prosthetic heme groups that shuttle electrons from FAD to oxygen. It has been suggested that the prosthetic heme, which has been recognized as a photosensi-tizer, responds to the delivery of blue light. Stimulation of NOX could potentially provide two benefits: first, phagocytes are activated, and second,dermatophytes are susceptible to the toxic effects of ROS.

COMBINATION OF 635nm AND 405nm

eNOS→Nitric Oxide (NO)
Cytochrome c oxidase→Reactive Oxygen Species (ROS)



The Lunula Clinical Studies Summary

~Published in Journal of Clinical and Aesthetic Dermatology 2017;10(5):24–30.~

METHODS

This retrospective study evaluated a sample of study toenails drawn from three independent clinical trials. Each of these trials employed comparable clinical trial protocols, including the same inclusion criteria, treatment administration, baseline subject characteristics, and endpoint evaluations. The device used in each clinical trial was a dual-diode laser with wavelengths of 635nm and 405nm (Lunula Laser™, Erchonia Corporation), which is classified by the FDA/IEC as a Class 2 laser device.

Enrolled subjects had not received prior treatment for onychomycosis. Treatment procedures were performed in the office or clinic of the investigators. During each treatment, the subject was seated with the non-thermal laser device on the floor in front of them. After being fitted with safety glasses, the subject placed the bare foot with the affected toenail to be treated on the treatment platform inside the non-thermal laser device. When the device was activated, the subject was simultaneously exposed to 405nm and 635nm laser light from a distance of approximately four inches. Subjects were treated for 12 minutes weekly for four weeks (Studies 1 and 3) or two weeks (Study 2). Safety glasses were worn by all subjects and investigators during treatment (Kentek Corporation; Pittsfield, New Hampshire).

The baseline characteristics and outcomes of each study are summarized in Table 2 . Each subject had agreed to refrain from other non-study treatments for toenail onychomycosis including oral medications and nail lacquer, alternative therapies, such as acupuncture and home remedies, or to use any toenail cosmetics throughout the course of study participation. Subjects were queried about potential adverse events at the end of each trial.

The clinical trials from which the data in this analysis were obtained conformed to the Good Clinical Practice guidelines of the International Conference on Harmonization.[31] Each protocol and all related documents were approved by a commercial institutional review board and/or ethics committee (Studies 1-3: Western Institutional Review Board®, Olympia, Washington and Saint Alphonsus IRB, Boise, Idaho; Study 1: Institute of Chiropodists and Podiatrists Ethics Board, Cork, Ireland). Each subject provided informed consent prior to participating in any study-related activities. ClinicalTrials.gov Identifier: NCT02588599.

RESULTS

Most treated toenails (67%) achieved the criteria for individual treatment success (?3mm of clear nail growth), exceeding the pre-established overall study success goal of 60 percent. The extent of clear nail at baseline increased by a mean of 5.18 (4.76) mm, increasing from 7.64 (4.50) at baseline to 12.82mm (3.69) after six months and exceeding the pre-determined criteria of 3mm ($p<0.0001$). In addition, 89 percent of treated toenails demonstrated an increase in clear nail across the six-month study period. The new clear nail growth of these 89 percent was 6.18 mm. Only six (11%) treated toenails demonstrated a decrease in clear nail during the study.

No adverse events were reported or observed at any time during three clinical trials from which samples were obtained.

CONCLUSION

Non-thermal laser therapy is a safe and effective tool for significantly increasing the extent of clear nail in onychomycosis infected toenails after six months following one weekly treatment for four weeks. Based on these results, this device became the first non-thermal laser to receive FDA 510(k) market clearance for increasing the extent of clear nail in patients with onychomycosis.

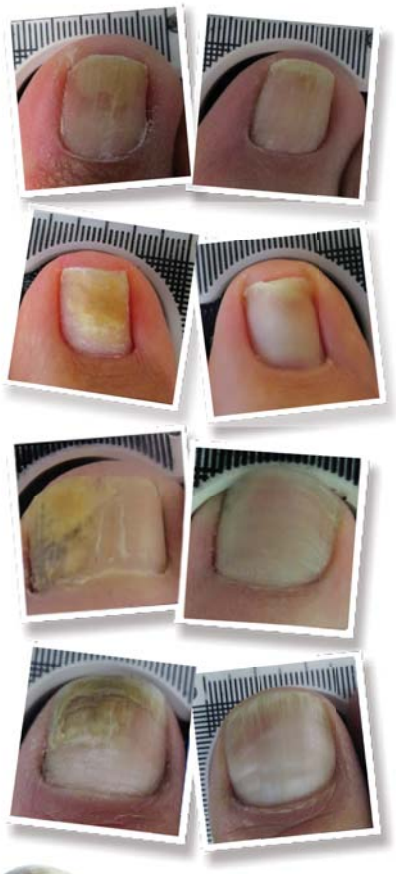
Table 2: Summary of initial onychomycosis studies using non thermal laser

	N	Patient Characteristics	Baseline Onychomycosis Characteristics	Treatment Outcome
Study 1 [46,47]	168	66% female. mean age 59.3 years	Mean duration of infection was 8.2 years involving 20-100% of the nail (mean, 81.2%)	After a mean of 6.4 months (range, 2 to 13 months), the mean extent of affected nail decreased to 31.3% ($p<0.0001$)
Study 2 [48]	105	58% female. mean age 59.5 years	Mean area of affected nail-bed was 57.4% and the mean length of clear nail-bed was 4.6 mm from the Lunula	After 3 months, 62% of subjects achieved individual study success (≥25% increase in clear nail-bed) Mean increase in clear nail was 30.4% ($p<0.0001$) The extent of clear nail-bed increased from 4.6 to 9.6mm ($p<0.0001$)
Study 3 [49]	109	58% Female. mean age 43.9 years	Mean duration of infection was 25.9 months with a mean of 63.2% nail involvement. The mean length of clear nail-bed was 5.9mm from the Lunula	At 36 weeks, 96% of treated toenails achieved individual study success (≥3mm of clear nail growth). The mean extent of clear nail increased to 15.1mm ($p<0.0001$). The extent of the affected nail decreased to 2.5% ($p<0.0001$)

PROVEN RESULTS

Lunula Laser requires very little time or set-up for physicians or their staff and the device has a pre-set treatment time and output energy. In fact, as little as four painless 12-minute sessions are needed to achieve results like these photos.

BEFORE & AFTER*



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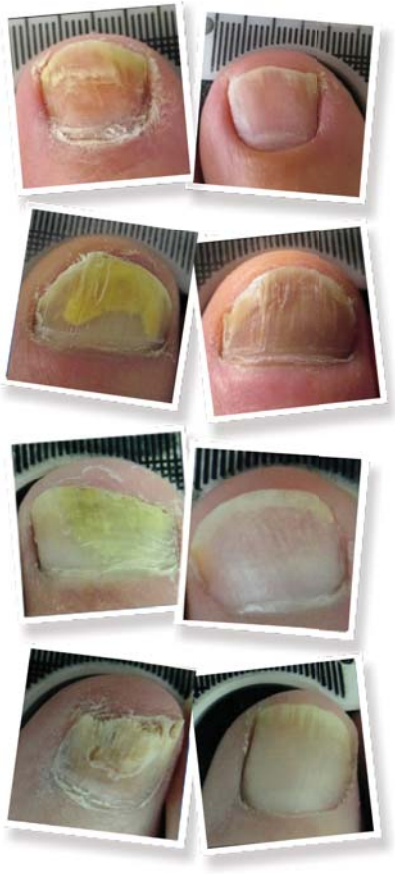

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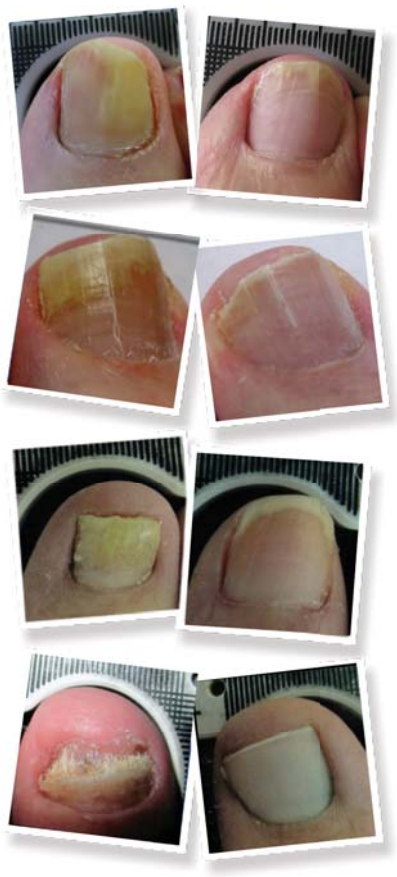

*These photographs were evaluated by a blinded investigator using an image manipulation software system that has been validated.

*Individual Results May Vary

Watch Lunula in Action!

BY ERCHONIA

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