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Ινστιτούτο Πληροφορικής και Τηλεπικοινωνιών  
Net Media Lab - Mind & Brain R&D



## Διαδικτυακή Ημερίδα

**"Ο Καταλυτικός Ρόλος των Γυναικών, των Ψηφιακών Τεχνολογιών και των Δεξιοτήτων του 21ου Αιώνα στην Αναβάθμιση του Σχολείου και της Κοινωνίας"**

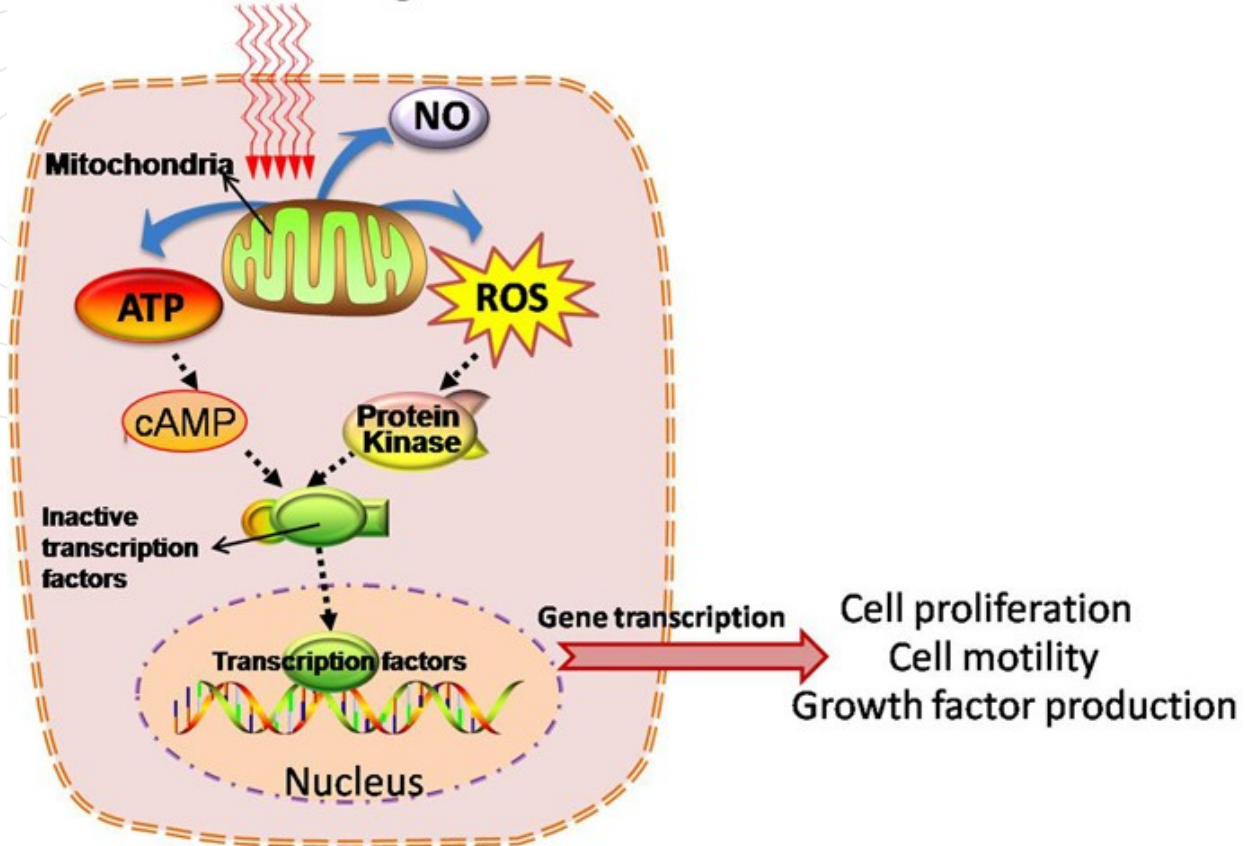
**Ο Ρόλος των Laser στην παρέμβαση και την αποκατάσταση σε θέματα υγείας και στην εκπαίδευση**

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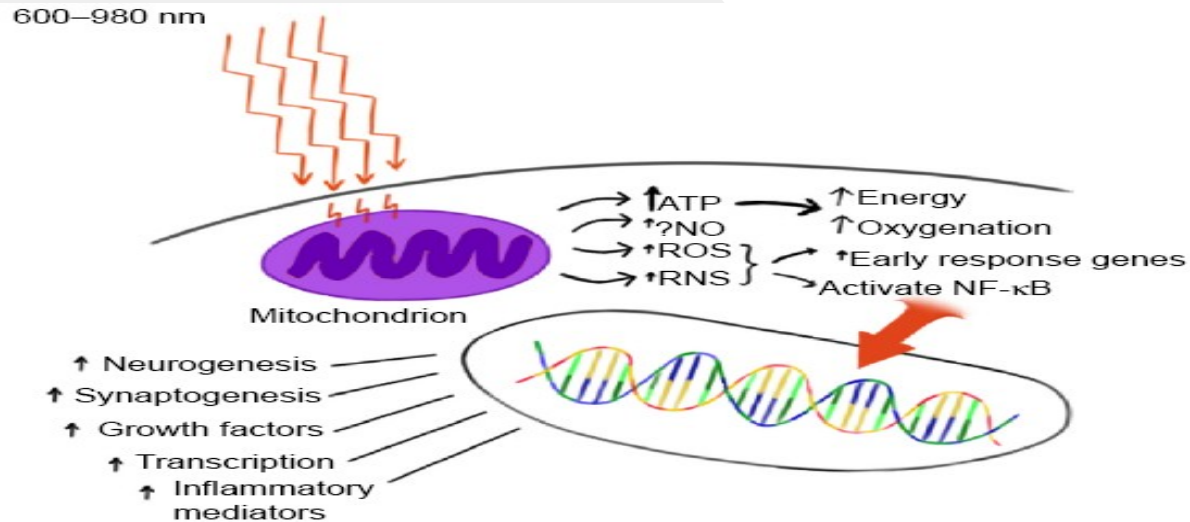
# INFRA-RED LIGHT

## Near infrared light



ΤΟ ΥΠΕΡΥΘΡΟ ΦΩΣ ΤΩΝ LASER ΔΙΕΓΕΙΡΕΙ ΤΑ ΜΙΤΟΧΟΝΔΡΙΑ ΚΑΙ ΠΑΡΑΓΟΝΤΑΙ ΥΨΗΛΑ ΕΠΙΠΕΔΑ ΕΝΕΡΓΕΙΑΣ (ΑΤΠ) ΕΝΩ ΤΑΥΤΟΧΡΟΝΑ ΠΑΡΑΓΟΝΤΑΙ ΑΥΞΗΤΙΚΟΙ ΝΕΥΡΟΤΡΟΦΙΚΟΙ ΑΝΤΙΦΛΕΓΜΟΝΩΔΕΙΣ ΠΑΡΑΓΟΝΤΕΣ, ΔΗΜΙΟΥΡΓΕΙΤΑΙ ΝΕΥΡΟΓΕΝΕΣΗ ΚΑΙ ΣΥΝΑΠΤΟΓΕΝΕΣΗ ΕΝΩ ΤΑΥΤΟΧΡΟΝΑ ΠΑΡΑΓΕΤΑΙ ΩΚΥΤΟΚΙΝΗ.

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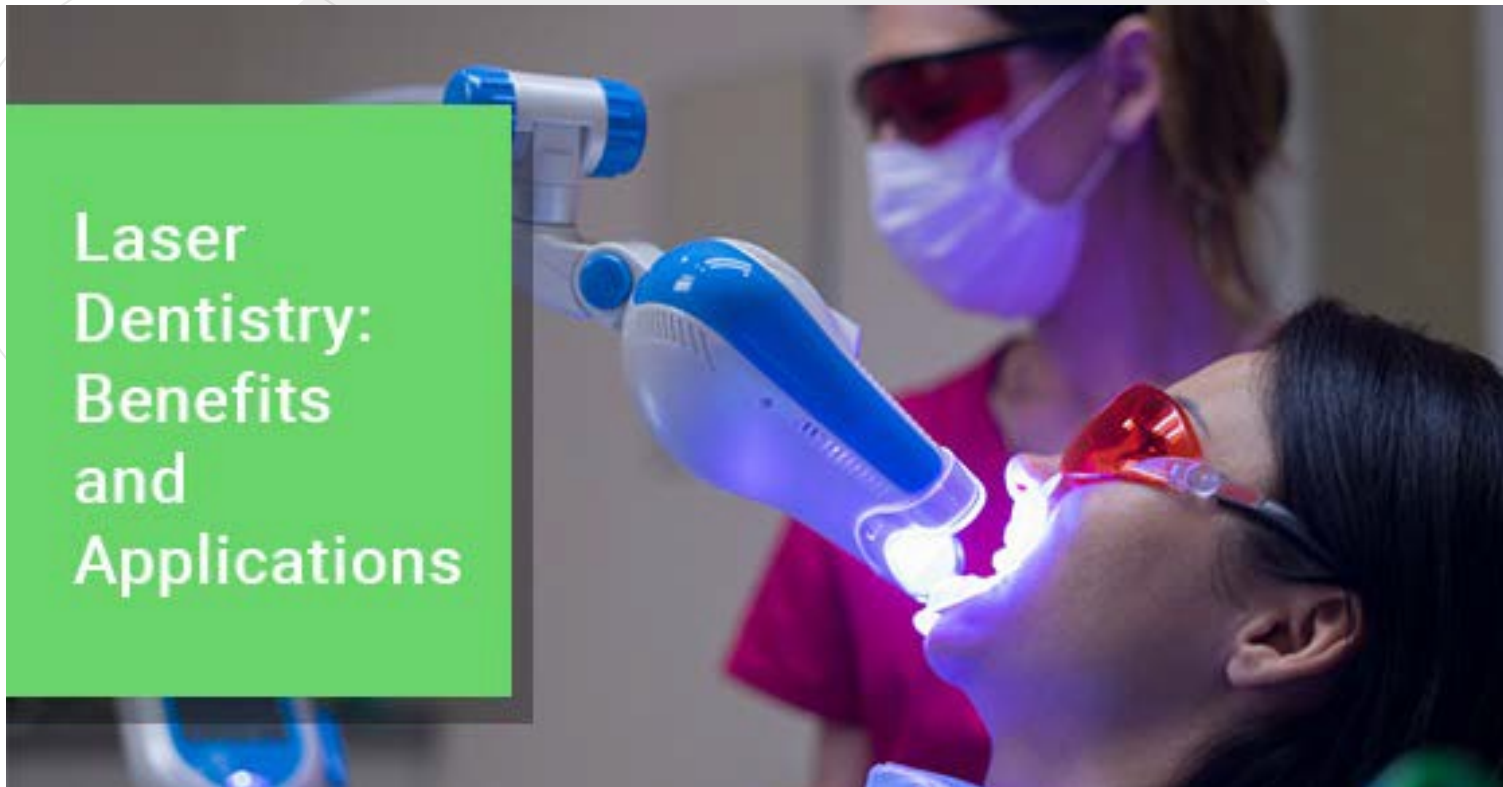


**Figure 1** Hypothesized mechanism of action of near-infrared light (NIR) photobiomodulation.

**Notes:** NIR (600–980 nm) penetrates tissue to variable depth depending on wavelength, coherence, time, and the tissue involved. A portion of the photonic energy reaches the mitochondria and is absorbed by cytochrome c oxidase. In addition to inducing increased adenosine triphosphate (ATP) production, NIR appears to initiate increased production of reactive oxygen species (ROS), reactive nitrogen species (RNS), and possibly (?) nitric oxide (NO). Downstream events include increased early response genes – *c-fos*, *c-jun* – and activation of nuclear factor kappa-B (NF-κB), which in turn induces increased transcription of gene products leading to neurogenesis, synaptogenesis, and increased production of growth factors and inflammatory mediators.

**Abbreviation:** ↑, increase.

# Laser Dentistry: Benefits and Applications



## Πλεονεκτήματα της χρήσης Laser

- Συντόμευση του χρόνου επούλωσης
- Αναγέννηση ιστών μέσω της ενεργοποίησης της παραγωγής κολλαγόνου
- Μειωμένη μετεγχειρητική αιμορραγία και πόνος.
- Αναισθησία σπάνια απαραίτητη
- Μειωμένη πιθανότητα επιμόλυνσης λόγω της αποστείρωσης που γίνεται με τα Lasers.
- Έχουν εξαιρετική ακρίβεια στη χρήση τους με αποτέλεσμα οικονομία ιστών
- Μικρότερη ανάγκη για ράμματα

## Χρήση των Lasers

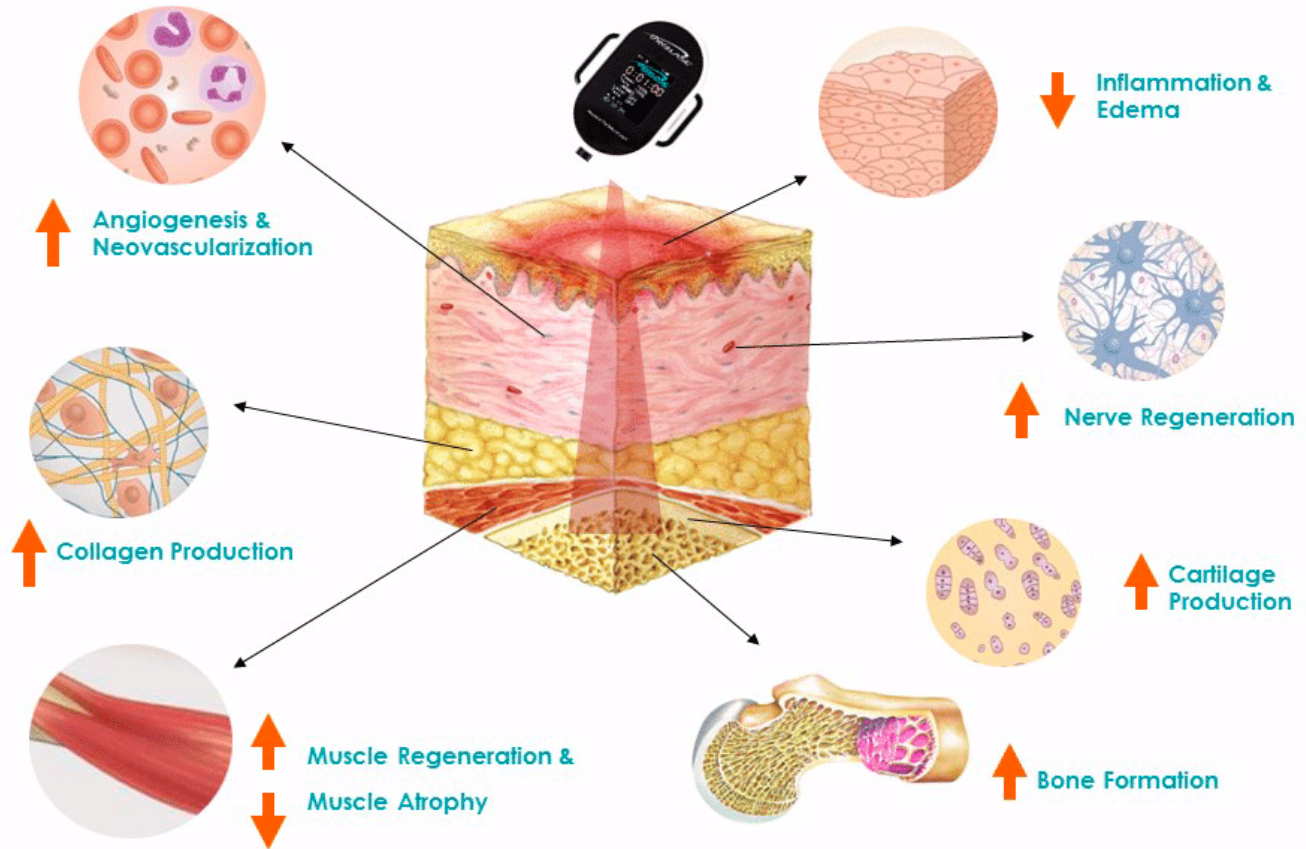
- Διάγνωση και αφαίρεση τερηδόνας
- Προετοιμασία δοντιού για έμφραξη και φατνίου για εμφυτεύματα
- Θεραπεία οδοντινικής ευαισθησίας
- Λεύκανση δοντιών

## Χρήση των Lasers

- Διόρθωση ουλικού χαμόγελου
- Επιμήκυνση μύλης
- Χειρουργική μαλακών ιστών και συγγενών ανωμαλιών όπως λαγόχειλος, λυκόστομα
- Θεραπεία αφθών
- Αφαίρεση καλοήθων όγκων
- Αφαίρεση ιστών για θεραπεία άπνοιας



# PHYSIOLOGICAL EFFECTS OF LLLT





# Low Level Laser Therapy

## LIGHTSPEED HEALING™ WITH THERALASE NON-THERMAL THERAPEUTIC LASER



ASK HOW  
 LIGHTSPEED HEALING™  
 CAN RELIEVE YOUR PAIN



*theraLASE*®  
 Healing at the Speed of Light®

For more information visit  
[www.theralase.com](http://www.theralase.com)

# We are now proud to offer Laser Therapy

## Common Applications:

- Tendon and ligament injuries
- Arthritis
- Soft tissue injuries
- Muscle strains
- Sore muscle and joints
- Degenerative joint conditions
- Neurological pain
- Chronic non-healing wounds
- General pain
- Musculoskeletal disorders
- Pre and post surgical treatment

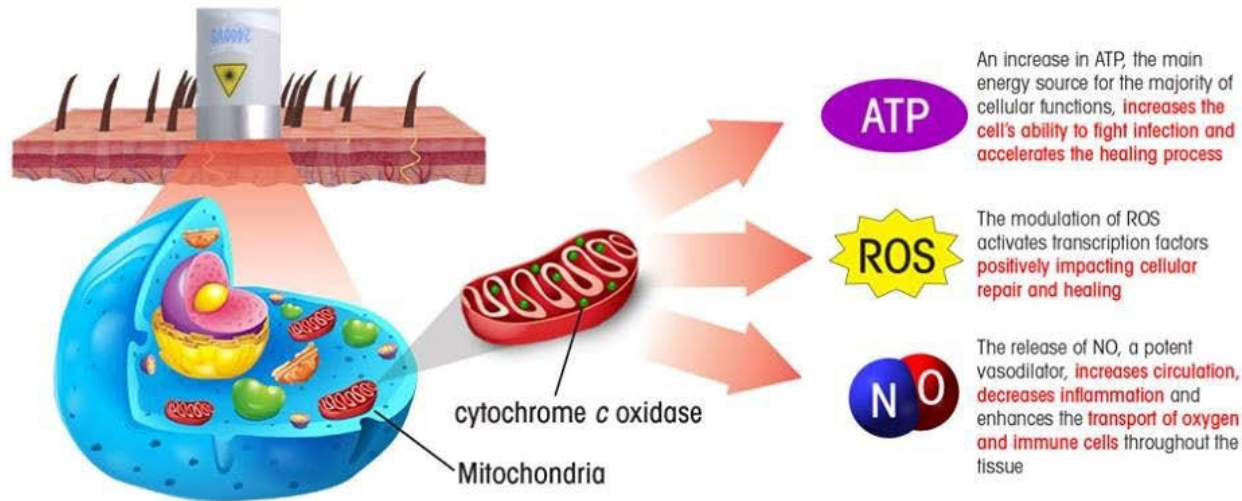
## Benefits of Laser Therapy

- Non-surgical treatment
- No patient sedation
- Extremely safe with no side effects
- Immediate results
- Speeds healing process

Ask us how Laser Therapy can help!

## Μηχανισμοί δράσης των Laser

### A MECHANISM OF LASER THERAPY IN TISSUE



**1** Laser light at a wavelength of 670nm, 808nm or 904nm is delivered to the tissue via a probe in **contact mode** with the surface of the skin.

**2** The light enters the cell's mitochondria and is absorbed by the chromophores, including the protein cytochrome c oxidase (CCO) which then **increases its activity**.

**3** As a result of this heightened activity, three molecules are affected: Adenosine Triphosphate (ATP), Reactive Oxygen Species (ROS) and Nitric Oxide (NO)

**ATP**

An increase in ATP, the main energy source for the majority of cellular functions, **increases the cell's ability to fight infection and accelerates the healing process**

**ROS**

The modulation of ROS activates transcription factors **positively impacting cellular repair and healing**

**NO**

The release of NO, a potent vasodilator, **increases circulation, decreases inflammation and enhances the transport of oxygen and immune cells** throughout the tissue

Ο τρόπος δράσης των θεραπειών αυτών βασίζεται στην απόκριση των κυττάρων που έχουν υποστεί βλάβη στο φως του **Laser** με την ενίσχυση της παραγωγής τριών σημαντικών για την αναγέννησή τους μορίων, τα οποία συμμετέχουν σε μηχανισμούς αναγέννησης και επούλωσης της φλεγμονής.

- 1.ATP**
- 2.ROS**
- 3.NO**

**ATP** is the main energy source for living cells and by increasing its levels the cells are capable of healing inflammation.

**ROS** at small amounts is stimulating muscle contraction and cell growth.

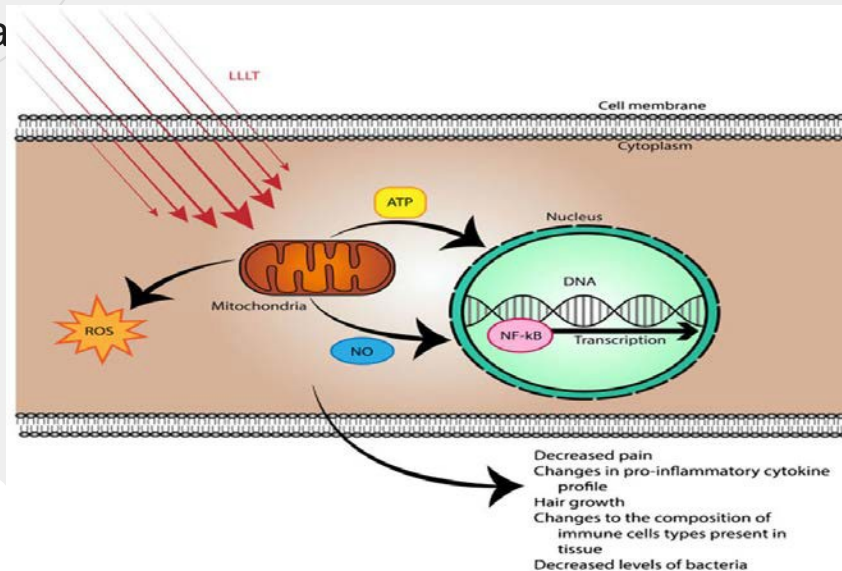
**NO** is a potent vasodilator which increases circulation in the inflamed tissue and enhances transport of oxygen and immune cells into the tissue.

*"These mechanism of action are obtained when exposing cell to soft laser light. High powered laser is not applicable as this type of laser is causing excessive heating of the skin along with upregulation the apoptosis pathway. Soft laser stimulates healing while high powered laser inhibits healing of inflammation."*

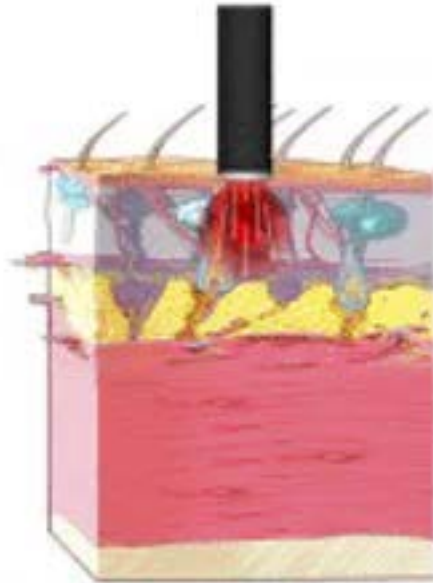




Transcranial absorption of photon energy by cytochrome oxidase, the terminal enzyme in mitochondrial respiration, is proposed as the bioenergetic mechanism of action of LLLT in the brain. Transcranial LLLT up-regulates cortical cytochrome oxidase and enhances oxidative phosphorylation. LLLT improves prefrontal cortex-related cognitive functions, such as sustained attention, extinction memory, working memory, and affective state. Transcranial infrared stimulation may be used efficaciously to support neuronal mitochondrial respiration as a new non-invasive, cognition-improving intervention in animals and humans. This fascinating new approach should also be able to influence other brain functions depending on the neuroanatomical structures used.



**Other Laser  
Class III**



**Treatment probe must  
contact the skin directly**

**LCT-1000  
Class IV Laser**



**Beam strength and probe  
allows an effortless therapy**



The study found that low-level laser therapy could be an effective tool for reducing irritability and other symptoms and behaviors associated with the autistic spectrum disorder in children and adolescents, with positive changes maintained and augmented over time.





In a study by **Gerry Leisman** et al. from **2018**, autistic participants received eight **5-minute** procedures of low-level laser treatment administered to the base of the skull and temporal areas across a **4-week** period. The researchers found that the following aspects improved:

- Irritability/agitation
- Lethargy/social withdrawal
- Stereotypic behaviour
- Hyperactivity/noncompliance
- Inappropriate speech\*

**The study found that low-level laser therapy could be an effective tool for reducing irritability and other symptoms and behaviors associated with the autistic spectrum disorder in children and adolescents, with positive changes maintained and augmented over time.**



**a**



**b**



**c**



**d**



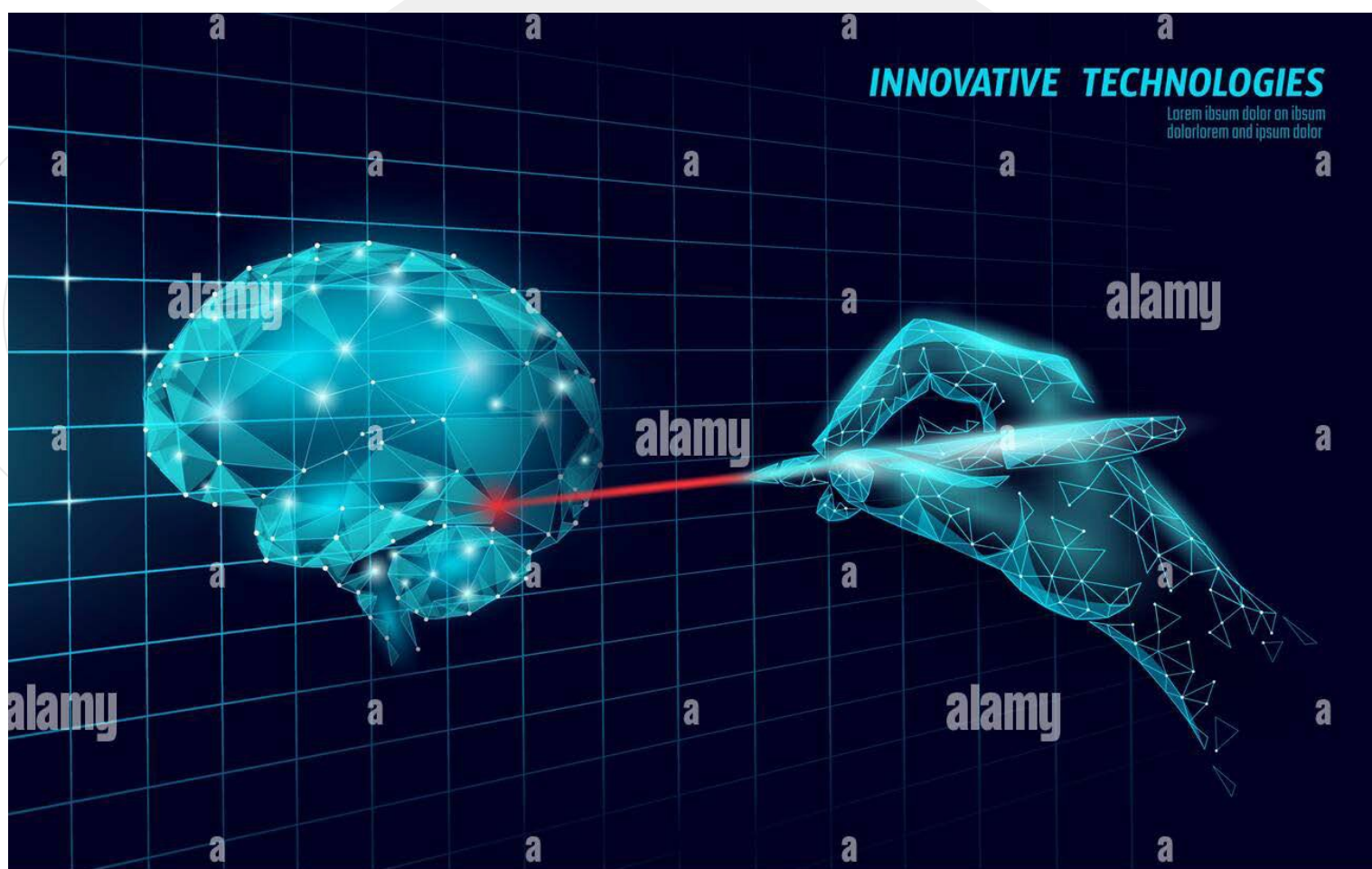
**Transcranial laser stimulation with low-power density ( $\text{mW}/\text{cm}^2$ ) and high-energy density ( $\text{J}/\text{cm}^2$ ) monochromatic light in the near-infrared wavelengths regulates and maintains brain functions and may promote neurotherapeutic effects in a non-destructive and non-thermal manner. Researchers determined through the first controlled research study that transcranial laser stimulation improves human cognitive and emotional brain functions.**



DEMOKRITOS

## INNOVATIVE TECHNOLOGIES

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alamy

Image ID: 2BK5XG0  
[www.alamy.com](http://www.alamy.com)

# Table 1: Indications for laser therapy in acute conditions

Abscesses	Mastitis
Acral lick dermatitis	Otitis
Acute nephritis	Postsurgical pain relief
Acute pain	Postoperative healing
Bacterial infections	Pyotraumatic dermatitis
Burns	Skin grafts
Edema	Snake bites
Fractures	Soft tissue trauma
Fungal infections	Sprains and strains

## Table 2: Indications for laser therapy in chronic conditions<sup>13</sup>

Osteoarthritis	Pyoderma
Bursitis	Respiratory disorders
Chronic pain	Elbow dysplasia
Degenerative joint disease	Neurological disorders
Feline asthma	Orthopedic disorders
Geriatric disorders	Otitis
Gout	Stomatitis
Intervertebral disc disease	Urinary tract disorders
Hip dysplasia	





# Ευχαριστώ για την προσοχή σας

Ερωτήσεις;

Ο Ρόλος των **Laser** στην παρέμβαση και την αποκατάσταση σε  
θέματα υγείας και στην εκπαίδευση

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