

# Apparatus and Methods for Stimulating DNA Repair Using Red Light Therapy

Tech ID: 30453 / UC Case 2019-104-0

## BACKGROUND

Red light exposure can have phototherapeutic effects on skin cells and other biological cells and tissues affected by UV damage. However, existing methods and devices using red light in DNA phototherapy have not identified the proper duration, intensity, or delivery mechanisms for optimal DNA repair. If the radiant intensity of the red light is too low, then exposure is inadequate and the repair biomarkers are not activated. Conversely, prolonged exposure to excessive electromagnetic radiation only furthers DNA damage. Moreover, in the context of skin treatment, excessive radiant intensity can burn tissue or have carcinogenic side effects. Thus, there is a need for a device and methods of use that provide safe, effective, and targeted red light DNA phototherapy.

## TECHNOLOGY DESCRIPTION

Researchers at UC San Diego have developed a red therapy device that can be used to repair DNA damage resulting from UV and oxidative damage, as well as general DNA damage where no specific source can be identified. By implementing red light therapy the apparatus can repair DNA in human and non-human animal subjects. The technology will use red light of about of 630 nm in wavelength to trigger the repair and synthesis of DNA. Specifically the technology administers red light therapy through an array of LED lamps in radiant intensities between 180  $\mu\text{W}/\text{cm}^2$  and 50  $\text{mW}/\text{cm}^2$  with dosage times between 5 minutes and 60 minutes; dosage powers translate to an equivalent energy dosage of 0.05  $\text{J}/\text{cm}^2$  to 100  $\text{J}/\text{cm}^2$ .

## APPLICATIONS

Cosmetic skin treatment: Treatment of skin tissue for healing, protective, and regenerative effects could be self-administered and used as an “at home” device for sunburn recovery, sunburn protection, reversing or preventing tissue/skin aging, stimulating tissue/skin repair, stimulating tissue/skin regeneration.

In cell and DNA amplification: Another application would be in the industrial amplification of cell lines and stem cell lines, with resulting genomes expected to have less damage, thereby increasing the genome quality, reproducibility, and viable yield.

Cancer: Preliminary evidence would suggest that this therapy could be used to improve the effectiveness of some cancer treatments because of the ability to repair damaged DNA, this would at least in part, restore some natural genetic checkpoints and the related cell-death responses which some cancer treatments leverage to achieve their therapeutic effects.

## ADVANTAGES

Wavelength: The specific wavelength of 630 nm  $\pm$  5 nm on which we are operating is unique within the realm of light therapy.

Dosage and dosage on wavelength: The specific dosages of 0.18  $\text{mW}/\text{cm}^2$ , and 30  $\text{mW}/\text{cm}^2$ , up to 50  $\text{mW}/\text{cm}^2$  on the 630  $\pm$  5 nm wavelength have not been mentioned in previous art. Overall our methods utilize, a specific wavelength range, at higher intensities, and longer exposures to specifically achieve DNA repair and DNA synthesis.

Specific dosages targeting DNA repair and synthesis: The specific dosages (in intensity, wavelength, time, and the equivalent overall power) achieved by this invention are novel in both their numerical value and actual effect.

Active and programmable temperature control via heating and cooling: A thermal sensor within the treatment platform gives exact temperature readings to a programmable central circuit. There is also the option to use programmable temperature control to heat or cool the treatment site to establish conditions for optimal DNA repair and synthesis.

## STATE OF DEVELOPMENT

The invention is currently in the working prototype stage. Experiments have been conducted indicating the prototype operates as described and achieves the desired results.

## INTELLECTUAL PROPERTY INFO

Patent Pending

## PATENT STATUS

Patent Pending

## CONTACT

University of California, San Diego  
Office of Innovation and  
Commercialization  
[innovation@ucsd.edu](mailto:innovation@ucsd.edu)  
tel: 858.534.5815.



## OTHER INFORMATION

### KEYWORDS

Red Light Therapy, cancer, DNA  
  
repair, cosmetics, cell healing,  
  
biostimulation, skin healing, UV  
  
exposure, skin rejuvenation

### CATEGORIZED AS

- **Medical**
  - Devices
  - Disease: Dermatology
  - Rehabilitation
- **Engineering**
  - Other

### RELATED CASES

2019-104-0

University of California, San Diego  
Office of Innovation and Commercialization  
9500 Gilman Drive, MC 0910, ,  
La Jolla, CA 92093-0910

Tel: 858.534.5815  
innovation@ucsd.edu  
<https://innovation.ucsd.edu>  
Fax: 858.534.7345

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