

# Talking About...

# Red Light



## Nitric Oxide (NO)

A chemical molecule released from smooth muscle when triggered by the body's parasympathetic response and/or polychromatic light therapy



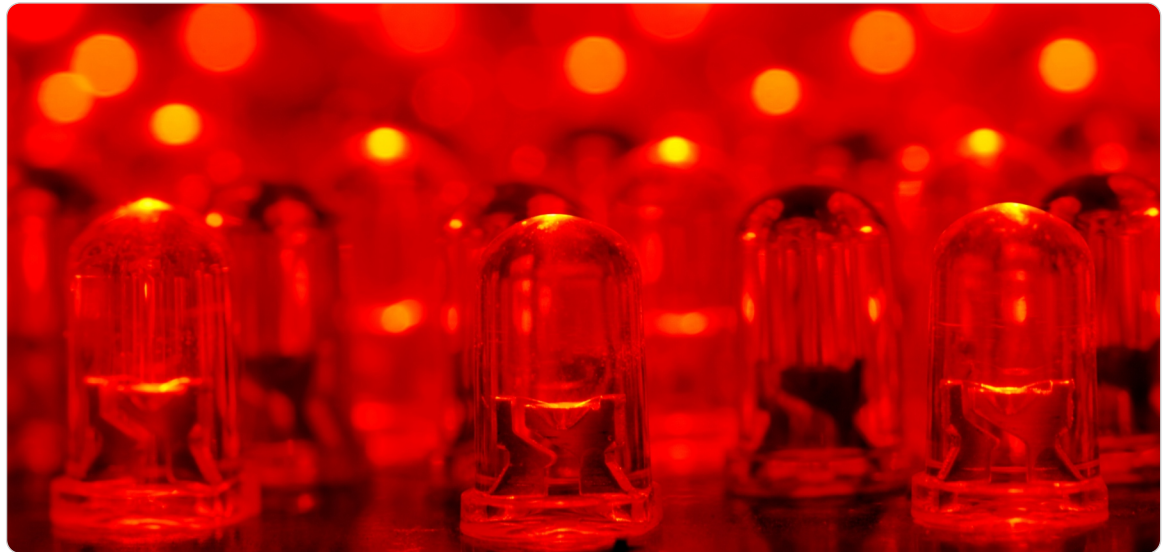
## Near infrared light (NIR)

Refers to the use of infrared light applied directly to living tissue



## Angiogenesis

The physiological process through which new blood vessels form from pre-existing vessels.



Researchers have been exploring the science of photobiomodulation since the 1960's with particular emphasis on the colors red, infrared, and blue. Red light emitting diodes have a spectral width ranging from 600 – 700 nanometers with a power density (irradiance) between 1mw-5W/cm<sup>2</sup>. Red and near infrared [R/NIR] light, when applied directly to the skin, has a wide range of beneficial physiologic effects. Science has used R/NIR to reduce infarct size, protect neurons from methanol toxicity, heal chemotherapy-induced mucositis, and stimulate angiogenesis.

### CIRCULATION

Low-level red/infrared (670 nm, R/NIR) irradiation of blood and muscle facilitates NO release, an essential chemical messenger of the cardiovascular system. Repeated R/NIR exposure stimulates angiogenesis and peripheral vascular collateralization in vivo and in vitro.

*Lohr, NL, Ninomiya, JT, Wartier, DC, Weihsrauch, D. Far Red/Near Infrared Light Treatment Promotes Femoral Artery Collateralization in the Ischemic Hindlimb. J Mol Cell Cardiol. 2013 September ; 62: 36-42.*

### WOUND HEALING

"The results demonstrate that photobiomodulation (PBM) at an energy density of 4 J/cm<sup>2</sup> is effective in improving the healing of cutaneous wounds in an animal model of type II diabetes, suggesting that PBM (632 nm, 4 J/cm<sup>2</sup>) would be effective in treating chronic cutaneous wounds in diabetic patients."

*Byrnes KR, Barna L, Chenault VM, Waynant RW, Ilev IK, Longo L, Miracco C, Johnson B, Anders JJ. Photobiomodulation improves cutaneous wound healing in an animal model of type II diabetes. Photomed Laser Surg. 2004 Aug;22(4):281-90.*

"LED treatment of ischemia challenged tissue improved early wound healing by enhancing angiogenesis irrespective of the wavelength [sic

red 629 nm or blue 470 nm] thus delineating this noninvasive means as a potential, cost effective tool in complicated wounds."

*Dungel P1, Hartinger J, Chaudary S, Slezak P, Hofmann A, Hausner T, Strassl M, Redl H, Mittermayr R. Low level light therapy by LED of different wavelength induces angiogenesis and improves ischemic wound healing. Lasers Surg Med. 2014 Oct 31.*

### EXERCISE

"Study outcomes consistently demonstrated ergogenic and prophylactic benefits to skeletal muscle after a treatment dose of phototherapy. Positive outcomes occurred when phototherapy was administered pre-exercise and postexercise. Investigators could conclude that exposing skeletal muscle to single-diode and multidiode laser or multidiode LED therapy positively affects physical performance by delaying the onset of fatigue, reducing the fatigue response, improving post exercise recovery, and protecting cells from exercise-induced damage."

*Paul A. Borsa, PhD, ATC, FACSMT\*; Kelly A. Larkin, PhD, CAT(C)\*; Jerry M. True, DC, FIACN. Does Phototherapy Enhance Skeletal Muscle Contractile Function and Postexercise Recovery? A Systematic Review. Journal of Athletic Training 2013;48(1):57-67*