

[Lasers Med Sci.](#) 2015 Dec 4. [Epub ahead of print]

Local changes in arterial oxygen saturation induced by visible and near-infrared light radiation.

[Yesman SS](#)¹, [Mamilov SO](#)¹, [Veligotsky DV](#)¹, [Gisbrecht AI](#)².

[+ Author information](#)

Abstract

In this study, we investigate the efficiency of laser radiation on oxyhemoglobin (HbO₂) rate in blood vessels and its wavelength dependence. The results of in vivo experimental measurements of the laser-induced photodissociation of HbO₂ in cutaneous blood vessels in the visible and near-infrared (IR) spectral range are presented. Arterial oxygen saturation (SpO₂) was measured by a method of fingertip pulse oximetry, which is based on the measurement of the modulated pulse wave of the blood. The light irradiating the finger was provided by corresponding light-emitting diodes (LED) at 15 wavelengths in the 400-940 nm spectrum range. Statistical results with a value of $p < 0.05$ were viewed as being significant for all volunteers. The results show that there is a decrease in SpO₂ in the blood under the influence of the transcutaneous laser irradiation. Three maxima in the spectral range (530, 600, and 850 nm) are revealed, wherein decrease in the relative concentration of SpO₂ reaches $5 \% \pm 0.5 \%$. Near-IR radiation plays a dominant role in absorption of laser radiation by oxyhemoglobin in deeper layers of tissue blood vessels. The obtained data correlate with the processes of light propagation in biological tissue. The observed reduction in SpO₂ indicates the process of photodissociation of HbO₂ in vivo and may result in local increase in O₂ in the tissue. Such laser-induced enrichment of tissue oxygenation can be used in phototherapy of pathologies, where the elimination of local tissue hypoxia is critical.

KEYWORDS: Arterial oxygen saturation; Light-emitting diodes; Oxyhemoglobin photodissociation; Pulse oximetry

PMID: 26637304 [PubMed - as supplied by publisher]