

## Review article

# Only lasers can be used for low level laser therapy

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### ABSTRACT

The question of lasers' exclusivity, as well as the degree of influence of special properties of low-intensity laser illumination (LILI), such as coherence, polarity and monochromaticity, on the effectiveness of low level laser therapy (LLLT) continues to cause arguments.

The study analyzes publications from 1973 to 2016, in which laser and conventional light sources are compared, and the following conclusions are drawn. First, there are a lot of publications with incorrect comparison or unfounded statements. Secondly, other sources of light are often meant by LILI without any justification. Thirdly, all studies, in which the comparison is carried out correctly and close parameters of the impact and the model are used, have a firm conclusion that laser light is much more effective. Fourthly, it is uniquely identified that the most important parameter that determines the efficiency of lasers is monochromaticity, *i.e.*, a much narrower spectral width than for all other light sources.

Only laser light sources can be used for LLLT!

Translational medicine promotes a faster implementation of scientific achievements in the field of practical public health, allowing a personalization of treatment, which positively affects its results. This interaction was described as "Bench-to-Bedside" or "Bedside-to-Bench" [1]. This is an interdisciplinary field of modern medicine, based on the achievements of science: physiology, molecular biology, genetics and clinical research, created to ensure a higher efficiency of medical services.

Laser therapy is a vivid example of interdisciplinary medicine, which was based on the fundamental research in the field of physiology, biophysics and biochemistry, resulting in the emergence of highly effective therapeutic techniques that take into account the individual characteristics of the patient. However, it is only possible to see the full potential of laser therapy by strictly following the rules, and using appropriate equipment.

## 1. Historical background

Therapeutic properties of "concentrated" light, *i.e.* lamp (*e.g.* UV, blue or red) isolated by narrow part light filter from total spectral irradiation range, were known already in the nineteenth century. This discovery formed the basis for a new field of medicine – light- or phototherapy, and in 1903 N.R. Finsen was awarded the Nobel Prize "in recognition of his contribution to the treatment of diseases, especially lupus vulgaris, with concentrated light radiation, whereby he opened a new avenue for medical science".[2] All researchers of that time were convinced that to improve effec-

tiveness of phototherapy it was necessary to meet the following conditions: decrease the width of the spectral range to the limit and set optimal light capacity, contacted area, exposure [3-10].

Low level laser therapy—a method of treatment which appeared in the late 1960's in countries in Eastern Europe, followed by a significant development in Russia [11, 12], and is now continuing to gain recognition around the world. The results of numerous studies of the laws of biomodulating action (BMA) of low-intensity laser illumination (LILI), carried out on animals, and their treatment regimens formed the basis of the method, widely used both in veterinary medicine and medicine: urology, neurology, dentistry, pediatrics, otorhinolaryngology, gynecology, *etc.* [12-19].

One of the problems that hinders the development of low level laser therapy nowadays is the use of other light sources instead of lasers.

The term Low Level Laser Therapy (LLLT) originally came about to be specifically about lasers [20], but more and more often, the abbreviation LLLT was read as "low level laser (light) therapy" [21, 22], or the word "laser" was replaced by "light" as a synonym [23], unequivocally declaring the alleged absence of differences [24] and guided by good intentions, so as not to "get confused" [25]. The motivation for these actions is strange: "Both laser and ordinary light are photons, light is light, so there is no difference" [26, 24].

It is so far unclear, why such statements are made. This is a dangerous assumption, and, for example, you cannot use a jackhammer instead of a scalpel for a surgical operation, despite both

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