



## Low Level Laser Therapy & DNA clinical research

### Low level laser therapy (LLLT) - Does it damage DNA?

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#### Abstract

Low level laser therapy (LLLT) has been found beneficial in a wide variety of therapeutic applications (see for example 1). However, some concern has arisen on possible DNA damage. May it be possible that it benefits the patient only at a first glance but damages DNA and therefore increases the risk of therapy induced disease up to an increased cancer risk ?

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What are the facts ? LLLT is usually performed with red (630 nm) or near infrared (830nm ) laser light. Typical accumulated doses per area are of the order of a few Joules per square centimeter. What an effect may such irradiation may have on DNA ? Unfortunately, most studies on the effects of radiation on DNA are performed with ionizing radiation (alpha, beta , gamma rays) or with UV light. There, DNA damage may be dramatic, although such studies have revealed a surprisingly strong DNA repair capacity of otherwise healthy human cells. Even when the overall integrity of a cell's genome is seriously degraded, the damaged DNA can be repaired without directly detectable consequences (although long term mutational damage cannot be completely excluded).

In conclusion, COMET assay experiments reveal possible therapeutic effects of LLLT but do not indicate a risk of DNA damage.

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## **He-Ne laser irradiation protects B-lymphoblasts from UVA-induced DNA damage.**

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The effect of He-Ne laser (632.8 nm) pre-irradiation on UVA (343 nm)-induced DNA damage in the human B-lymphoblast cell line NC37 was investigated using the comet assay. He-Ne laser pre-irradiation was observed to result in a dose-dependent decrease in UVA-induced DNA damage. This effect was also found to be dependent on the incubation period between He-Ne laser pre-irradiation and the UVA exposure. Whereas the control cells with a higher DNA damage point to an initial ability of faster repair, both the control and the He-Ne laser pre-irradiated cells subsequently show the same rate of DNA repair. The results suggest that He-Ne laser irradiation protect the cells from UVA-induced DNA damage primarily through an influence on processes that prevent an initial DNA damage.

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## **Exact action spectra for cellular responses relevant to phototherapy.**

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OBJECTIVE: The aim of the present work is to analyze available action spectra for various biological responses of HeLa cells irradiated with monochromatic light of 580-860 nm. BACKGROUND DATA: Phototherapy (low-level laser therapy or photobiomodulation) is characterized by its ability to induce photobiological processes in cells. Exact action spectra are needed for determination of photoacceptors as well as for further investigations into cellular mechanisms of phototherapy. METHODS: Seven action spectra for the stimulation of DNA and RNA synthesis rate and cell adhesion to glass matrix are analyzed by curve fitting, followed by deconvolution with Lorentzian fitting. Exact parameters of peak positions and bandwidths are presented. RESULTS: The peak positions are between 613.5 and 623.5 nm (in one spectrum, at 606 nm), in the red maximum. The far-red maximum has exact peak positions between 667.5 and 683.7 nm in different spectra. Two near infrared maxima have peak positions in the range 750.7- 772.3 nm and 812.5-846.0 nm, respectively. CONCLUSIONS: In the wavelength range important for phototherapy (600-860 nm), there are four "active" regions, but peak positions are not exactly the same for all spectra.

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