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Low-Level Laser Irradiation (InGaAlP-660 nm) Increases Fibroblast Cell Proliferation and Reduces Cell Death in a Dose-Dependent Manner.

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Abstract Background and Objective: Impaired cell metabolism and increased cell death in fibroblast cells are physiological features of chronic tendinopathy. Although several studies have shown that low-level laser therapy (LLLT) at certain parameters has a biostimulatory effect on fibroblast cells, it remains uncertain if LLLT effects depend on the physiological state. **Study Design/Material and Methods:** High-metabolic immortal cell culture and primary human keloid fibroblast cell culture were used in this study. Trypan blue exclusion and the 3-(4,5-dimethylthiazol-2-yl)-2,5-diphenyltetrazolium bromide (MTT) test were used to determine cell viability and proliferation. Propidium iodide stain was used for cell-cycle analysis by flow cytometry. Laser irradiation was performed daily on three consecutive days with a GaAlAs 660-nm laser (mean output: 50 mW, spot size 2 mm²), power density =2.5 W/cm²) and a typical LLLT dose and a high LLLT dose (irradiation times: 60 or 420 s; fluences:150 or 1050 J/cm²); energy delivered: 3 or 21 J). **Results:** Primary fibroblast cell culture from human keloids irradiated with 3 J showed significant proliferation by the trypan blue exclusion test ($p < 0.05$), whereas the 3T3 cell culture showed no difference using this method. Propidium iodide staining flow cytometry data showed a significant decrease in the percentage of cells being in proliferative phases of the cell cycle (S/g²/M) when irradiated with 21 J in both cell types (hypodiploid cells increased). **Conclusions:** Our data support the hypothesis that the physiological state of the cells affects the LLLT results, and that high-metabolic rate and short- cell-cycle 3T3 cells are not responsive to LLLT. In conclusion, LLLT with a dose of 3 J reduced cell death significantly, but did not stimulate cell cycle. A LLLT dose of 21 J had negative effects on the cells, as it increased cell death and inhibited cell proliferation.

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