Morphological changes and cell viability of GL261 and SMA-560 mouse glioma cells affected by direct infrared light illumination

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AIM

The aim of this work was to experimentally examine the *in vitro* photokilling potential of continuous-wave infrared laser light on murine **GL261** and **SMA-560** glioma cancer cells.

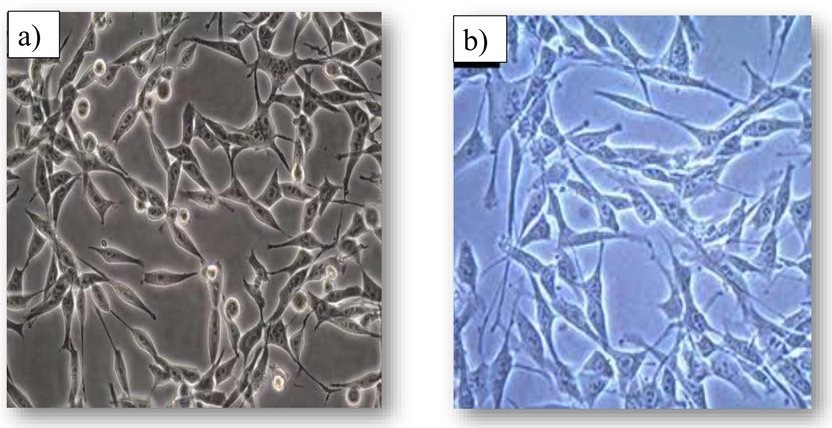

Figure 1. Brightfield images of a) Murine GL261 cell line; b) SMA-560 cell line.

BACKGROUND

Glioma is a type of primary, malignant, highly lethal brain tumour [1]. Prevailing glioma treatment options include chemotherapy, surgical removal, and radiation therapy, which can cause severe side effects. On the other hand, light-based therapies, such as direct light therapy [2], photothermal [3], and photodynamic therapy [4], are minimally invasive, non-cumulative, and non-toxic treatment modalities, offering an effective and less damaging alternative to more invasive anti-cancer treatments.

Figure 2. Glioma is a type of primary tumour that starts in the glial cells of the brain (or spinal cord, not shown in the Figure).

GlioLighT
NEXT GENERATION GLIOMA TREATMENTS

MATERIALS AND METHODS

Cell viability was measured as a function of laser beam intensity and compared to a control, which was kept in the dark for 30 minutes. The laser wavelength was centred at 831 nm, and the beam diameter was approximately 6 mm. Glioma cells in each microtiter well were illuminated for 10 minutes at room temperature, ≈ 20˚C, with a total dose of ≈492 J/cm² and ≈ 313 J/cm2 for SMA 560 and GL261 cells, respectively.

RESULTS AND DISCUSSION

The obtained results showed that the minimal achieved viability was slightly below 60% for the SMA-560, whereas for the GL261 cell line, this value was ≈ 69%.

Monitoring the morphological changes in illuminated cells is often used to elucidate the influence of light on cancer cells. In GL261 cells, after illumination, a large number of round cells grouped in clusters can be observed. In SMA-560, after the light treatment, there is a significant decrease in the number of living cells, accompanied by a change in shape: cells lose their characteristic elongated profile and become round and shrunken. These morphological changes are typically observed in dying cells and suggest a cytotoxic effect of the light on the glioma cell lines.

Figure 1. Brightfield images of a) control GL261 cell line; c) control SMA-560 cell line. after illumination for 10 minutes at room temperature, b) with a total dose of 313 J/cm² for GL261 cells and d) with a total dose of ≈492 J/cm² for SMA 560 cells.

CONCLUSION

These results demonstrate the effect that direct light therapy has on glioma cells and emphasise the potential of this approach in combating cancer.

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