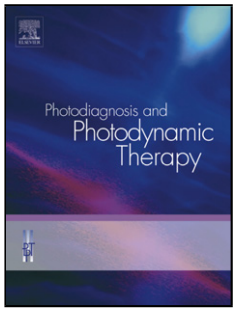

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Light source is critical to induce glioblastoma cell death by photodynamic therapy using chloro-aluminiumphtalocyanine albumin-based nanoparticles

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Abstract

Selection of an efficient light source is fundamental in the development of photodynamic therapy (PDT) protocols. However, few studies provide a comparison of different light sources with regard to phototoxic effects. Here, we compared the cell death induced by photoactivation of chloro-aluminiumphtalocyanine (AlClPc)-loaded human serum albumin nanoparticles under irradiation with different light sources: continuous laser (CL), pulsed laser (PL), and light-emitting diode (LED). Cells were exposed to three different AlClPc concentrations (1, 3, and 5 μM) and three different light doses (200, 500, and 700 mJ/cm²) for each light source. Cell death and differentiation of apoptosis and necrosis pathway were measured by flow cytometry. CL was the best light source for improving the photodynamic action of AlClPc-loaded albumin nanoparticles in glioblastoma cells and avoiding undesirable side effects, especially at low photosensitizer doses (200 mJ/cm²). In addition, apoptosis was the main cell death pathway in all evaluated cases (70% for CL, and greater than 50% for PL and LED). In conclusion, the search for optimal light sources and light/photosensitizer doses is a crucial step in improving PDT outcomes and enhancing the clinical translation of PDT.

Keywords: Continuous laser; pulsed laser; light-emitting diode; cell death; photodynamic action.

Background

Photodynamic therapy (PDT) associated with nanotechnology is a promising complementary treatment that, in combination with resection surgery, can be used to treat brain tumors in glioblastoma multiforme (GBM). Since the PDT-induced response