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Synergistic Cytotoxic Effects of Photodynamic Therapy and Cannabidiol Treatment on Cervical Cancer Cells

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Introduction: Cervical cancer (CC) is the fourth most diagnosed cancer in women worldwide. Conventional treatments include surgery, chemo- and radio- therapy, however these are often invasive and cause severe side effects. Additionally, approximately 70% of late-stage CC patients experience metastasis due to treatment resistance and limitations. There is thus a dire need to investigate alternative therapeutic combination therapies. Photodynamic therapy (PDT) is an alternative CC treatment modality that has been clinically proven to treat primary CC. Since PDT is a non-invasive localized treatment, with fewer side effects and less resistance to dose repeats, it is considered more advantageous. However, more research is required to refine its delivery and dosing, as well as improve its ability to activate specific immune responses to eradicate secondary CC spread. Cannabidiol (CBD) plant isolates post treatment, have been shown to exert in vitro CC anticancer effects and hinder secondary CC metastatic spread by causing apoptosis and inducing specific immune responses, which obstruct tumor invasion and angiogenesis.
Methodology: The focus of this study was to investigate the synergistic cytotoxic PDT effect of a sulphonated zinc phthalocyanine PS (ZnPcS4) when combined with CBD in order to prevent the primary and secondary survival of CC cells. The individual (to determine the minimum inhibitory concentration - MIC) and combinative effects of PDT and CBD treatments were assessed by exposing in vitro HeLa CC cultured cells to varying doses of ZnPcS4 PS and CBD and irradiating the cells using a 673 nm diode laser. The effects were measured using the Trypan blue viability and Lactate Dehydrogenase (LDH) membrane integrity cytotoxicity assay, as well as inverted microscopy to assess cellular damage.
Results: Individual PDT and CBD treated cellular responses showed dose dependent morphological damages, with decreased cellular viability and increased cellular cytotoxicity. The MIC for ZnPcS4 PS and CBD was found to be 0.125 µM and 0.5 µM respectfully. Combinative treatments at these MIC concentrations reported a significant 80% induction of cytotoxicity, with a notable 76% in cell death and morphological images revealed substantial cell death, suggestive of non-recovery.
Conclusion: The findings from this study suggest that the synergistic combinative ZnPcS4 PS PDT treatment of in vitro cultured HeLa CC cells with CBD, can successfully induce primary cellular destruction, as well as limit secondary CC metastatic spread and so warrants further confirmatory investigation within in vivo models.

Apply to be considered for a student ; award (Yes / No)?

No

Level for award;(Hons, MSc, PhD, N/A)?

N/A

Consent on use of personal information: Abstract Submission

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