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Special Issue Reprint

Photodynamic Therapy 2.0

Edited by
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This is a reprint of the Special Issue, published open access by the journal *Biomedicines* (ISSN 2227-9059), freely accessible at: https://www.mdpi.com/journal/biomedicines/special_issues/W50HI24NN4.

For citation purposes, cite each article independently as indicated on the article page online and as indicated below:

Lastname, A.A.; Lastname, B.B. Article Title. *Journal Name* **Year**, *Volume Number*, Page Range.

ISBN 978-3-7258-4971-0 (Hbk)
ISBN 978-3-7258-4972-7 (PDF)
https://doi.org/10.3390/books978-3-7258-4972-7

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Editorial

Photodynamic Therapy 2.0

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In 1903, Von Tappeiner and Jesionek [1] demonstrated the effectiveness of light therapy when combined with a photosensitizer and oxygen—a phenomenon known as "photodynamic action". Photodynamic therapy (PDT) is widely used in the medical field to treat a variety of oncological and non-oncological human disorders; it generates a high amount of reactive oxygen species that destroy oncological tissue, keratosis, and pathogens. In contrast, recent studies have demonstrated that mild PDT also has beneficial effects, such as wound healing [2], stress and pathogen resistance, and extended lifespan in animal models, such as *Caenorhabditis elegans*, under both normal and pathogen-infected conditions [3,4].

This Editorial, published in *Biomedicines*, provides a current and concise overview of "Photodynamic Therapy 2.0" and discusses recent studies pertaining to PDT. We provide a summary of the various contributions to date, emphasizing novel analytical methods and recent advancements in PDT.

Bowen's disease is a form of cutaneous squamous cell carcinoma (cSCC) that has a high risk of progression to an invasive form [5]. Conventional PDT is a primary treatment option, with varying protocols involving photosensitizers, light sources, and combinations of the two. Dermoscopy and re-reflectance confocal microscopy can monitor the therapeutic response. Treatment is generally well tolerated, with mild side effects and good cosmetic outcomes. A periodic follow-up is necessary because of the risk of recurrence and progression to cSCC [6]. As the incidence of the keratinocyte tumor increases, the opportunity for PDT will expand [7].

PDT has shown promise in treating brain tumors, particularly gliomas [8], with improved median survival rates and minimal side effects compared with conventional methods, such as surgery, radiotherapy, and chemotherapy. This promising approach may influence future treatments for this challenging and deadly disease, and further studies may lead to significant advancements in treating this tumor type [9].

Nasopharyngeal carcinoma, a malignancy linked to the Epstein–Barr virus (EBV), is associated with 140,000 deaths annually [10]. This study aimed to determine the efficacy of PDT in modulating the tumor microenvironment during nasopharyngeal carcinoma treatment. The review included a search of various databases and used the Oral Health Assessment Tool to assess bias. A meta-analysis revealed that PDT treatment significantly increased Interleukin (IL)-8, IL-1α, IL-1β, Microtubule Associated Proteins 1A/1B chain 3b (LC3) BI, LC3BII, Matrix Metallo Proteinase (MMP) 2, and MMP 9 levels in nasopharyngeal carcinoma cells, while reducing Nuclear Factor Kappa-Light-Chain-Enhancer of Activated B cells (NF-κB), miR BamHI-A Region Rightward Transcript (BART) 1-5p, BART 16, and BART 17-5p levels. PDT also reduced apoptosis and the viability of nasopharyngeal cancer cells infected with EBV. This treatment also increased latent membrane protein 1 levels compared with the control group. Further preclinical studies are needed to validate these results [11].

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