**Editorial**
Volume 7:2, 2022

Journal of Oncology Medicine & Practice

ISSN: 2576-3857 Open Access

# Mechanisms of Photodynamic Therapy

**Fonseca Laurier***

*Department of Pediatrics, Baylor College of Medicine, Texas, USA*

## Editorial

Photodynamic therapy is a type of phototherapy that uses light and a photosensitizing chemical substance in tandem with molecular oxygen to induce cell death. It is widely used in the treatment of acne. It is used in the treatment of a variety of medical conditions, including wet age-related macular degeneration, psoriasis, and atherosclerosis, and it has shown some efficacy in anti-viral treatments, including herpes. It also treats malignant cancers such as head and neck, lung, bladder, and specific skin cancers. The technology has also been tested for prostate cancer treatment in both a dog model and human prostate cancer patients. It is recognized as a minimally invasive and minimally toxic treatment strategy [1]. Other light-based and laser therapies, such as laser wound healing and rejuvenation and intense pulsed light hair removal, do not necessitate the use of a photosensitizer. Photosensitizers have been used to sterilize blood plasma and water in order to remove blood-borne viruses and microbes, and they have also been considered for agricultural applications such as herbicides and insecticides. The benefits of photodynamic therapy reduce the need for delicate surgery and lengthy recovery, as well as the formation of scar tissue and disfigurement [2]. The associated photosensitization of skin tissue is a side effect. The light source's wavelength must be appropriate for stimulating the photosensitizer to produce radicals and/or reactive oxygen species. These are free radicals produced by electron abstraction or transfer from a substrate molecule, as well as singlet oxygen, a highly reactive state of oxygen. PDT is a multi-step procedure. In the absence of light, a photosensitizer, ideally with negligible toxicity other than photo toxicity, is administered systemically or topically. When a sufficient amount of photosensitizer appears in diseased tissue, the photosensitizer is activated by prolonged exposure to light. The light dose provides enough energy to stimulate the photosensitizer but not enough to harm nearby healthy tissue. Target cells are killed by reactive oxygen [3].

Photodynamic therapy is a cutting-edge, non-invasive treatment for non-oncological diseases as well as cancers of various types and locations. It is based on the local or systemic application of a photosensitizer, a photosensitive compound that accumulates in pathological tissues [4]. The photosensitizer molecules absorb the appropriate wavelength of light, triggering activation processes that lead to the selective destruction of the inappropriate cells. Photo cytotoxicity reactions occur only within pathological tissues, where photosensitizers are distributed, allowing for selective destruction [5]. Over the last decade, there has been a significant acceleration in the development of nanotechnology. The combination of photosensitizers and Nanomaterials can improve photodynamic therapy efficiency while also eliminating side effects.

### Photosensitizers

There are numerous photosensitizers for PDT. They are classified as porphyrins, chlorins, and dyes. Aminolevulinic acid (ALA), Silicon Phthalocyanine Pc 4, m-tetrahydroxyphenylchlorin (mTHPC), and mono-L-aspartyl chlorin e6 are a few examples (NPe6). Allumera, Photofrin, Visudyne, Levulan, Foscan, Metvix, Hexvix, Cysview, and Laserphyrin are commercially available photosensitizers, with others in development, including Antrin, Photochlor, Photosens, Photrex, Lumacan, Cevira, Visonac, BF-200 ALA, Amphinex, and Azadipyrromethenes. The parts of the cell that photosensitizers target are what distinguish them. Unlike radiation therapy, which targets cell DNA, most photosensitizers target other cell structures. mTHPC, for example, is found in the nuclear envelope. ALA, on the other side, is identified in the mitochondria and methylene blue in the lysosomes.

### Applications

**Antitumor vaccines:** Photodynamic therapy of tumours has been shown in preclinical studies to enhance the host antitumor immune response. However, the role of the PDT effect on tumour cells as opposed to host tissues has not been determined. According to research, PDT-generated tumour cell lysates were potent vaccines, and PDT-generated vaccines may be more effective than other methods of creating whole tumour vaccines. PDT vaccines are tumor-specific and appear to induce a cytotoxic T-cell response. The results show that PDT effects on tumour cells alone are sufficient to generate an antitumor immune response, indicating that PDT's direct tumour effects play an important role in enhancing the host antitumor immune response. PDT-derived vaccines may also have clinical potential as an adjuvant, according to research.

**Antimicrobial photodynamic therapy:** Numerous studies and reviews of the literature have found that photodynamic disinfection is effective at killing a wide range of pathogens, including drug-resistant bacteria, viruses, and fungi, as well as inactivating inflammatory cytokines, which aids in the healing process. After numerous repeat treatments, photodynamic disinfection remains fully effective with no signs of resistance formation. In a maxillary sinus cavity model, PDT effectively treats CRS polymicrobial antibiotic resistant Pseudomonas aeruginosa and MRSA biofilms. Some photosensitizers have been chemically modified so that they can incorporate into mycobacteria's mycomembrane.

## Conflicts of Interest

None.

## References

1. Ren, XH, G-Y. Li, Hua Du and JP. Ma, et al. "Thermally activated delayed fluorescent (TADF) coordination polymer with the generation of singlet oxygen." *Acta Crystallogr C Struct Chem* 6 (2019): 758-767.
2. Kotagiri, Nalinikanth, Richard Laforest and Samuel Achilefu. "Reply to 'Is Cherenkov luminescence bright enough for photodynamic therapy?'." *Nat nanotechnol* 13 (2018): 354-355.
3. Castro, Kelly ADF, Nuno MM Moura, Flávio Figueira and Rosalina I. Ferreira, et al. "New materials based on cationic porphyrins conjugated to chitosan or titanium dioxide: Synthesis, characterization and antimicrobial efficacy." *Int J Mol Sci* 20(2019):2522.
4. Ni, Dalong, Carolina A. Ferreira, Todd E. Barnhart and Virginia Quach, et al. "Magnetic targeting of nanotheranostics enhances cerenkov radiation-induced photodynamic therapy." *J Am Chem Soc* 140 (2018):14971-14979.

***Address for Correspondence:** Fonseca Laurier, Department of Pediatrics, Baylor College of Medicine, Texas, USA, E-mail: laurier.f65@gmail.com*



**Date of Submission:** 07 April, 2022, Manuscript No. jomp-22-70433; **Editor Assigned:** 10 April, 2022, PreQC No. P-70433; **Reviewed:** 21 April, 2022, QC No. Q-70433; **Revised:** 25 April, 2022, Manuscript No. R-70433; **Published:** 30 April, 2022, DOI: 10.37421/2157-7145.2022.7.158

5. Zhu, Huangtianzhi, Huanhuan Wang, Bingbing Shi, Liqing Shangguan, et al. "Supramolecular peptide constructed by molecular Lego allowing programmable self-assembly for photodynamic therapy." *Nat Commun* 10 (2019):1-10.

**How to cite this article:** Laurier, Fonseca. "Mechanisms of Photodynamic Therapy." J Oncol Med & Pract 7 (2022): 158.