

Photosensitizes For Photodynamic Therapy Of Tumor (PDT)

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Introduction

The idea of [photodynamic therapy \(PDT\)](#) started in 1900. The discovery was made accidentally by a medical student in Munich who found that microorganisms like paramecia can be killed if they are exposed to light but not when kept in the dark. The moment it was discovered that the presence of oxygen in the air was essential for the light-mediated death effect to occur, it led to the coining of the term “Photodynamic action.” It didn’t take long enough after the discoveries that efforts were put in place to use the phenomena as a therapy for cancer through the painting of the dyes on the special skin tumors and then exposing them to the light. The delay in the exploration of PDT was caused by two world wars and also an impressive rise in the pharmaceutical industry in the mid-19th century. The efforts of researching PDT were revolutionized in 1970 in America by Dr. Thomas Dougherty while working at Roswell Park Cancer Institute. Dougherty and the other co-workers introduced the first photosensitizer, which consisted of the water-soluble mixture of the porphyrins named “haematoporphyrin derivative,” and after purification, it became “Photofrin” (Jiayuan, Dou, and Liming 1).

“Photofrin,” which is sometimes called “porfimer sodium,” is one of the photosensitizing agents that are used for “high-grade dysplasia (HGD) of the Barratts esophagus and PDT of the tumors.” Despite the fact that Photofrin is often used today throughout the world, it possesses many disadvantages, including photosensitivity of the skin that can last for some weeks or even months, which causes trouble for the patient. It also leads to a small absorbance peak of 630 nm, which makes it appear inefficient for use, especially for bulky tumors in which light penetration is problematic. Since that moment, medicinal chemists have added more effort to synthesizing and discovering different molecules that could be used for the improvement of photosynthesizers and other compounds that have been proposed to be useful in mediating PDT to handle cancer and many other diseases (Levy 3). PDT has come back to its earlier roots in the past years, and the antimicrobial photodynamic inactivation has shown the efforts of its return.

Porphyrin and metalloporphyrin have both led to the provision of an extremely versatile nanometer-size building block that is important in the control of material properties. The assembling of the porphyrin and the metalloporphyrin is tailored to the fundamental properties of the material that comes in response to the microscopic effects, their interaction with the applied magnetic, electric or electromagnetic field, or the interaction with the chemical species (KENNETH, NEAL, and MARGARET 412). The porphyrinic solids, films, and microporous materials have been studied based on the

interaction between the magnetic, electric, and electromagnetic fields, while chemo-responsive materials concern the interaction of the chemical species that act as sensors needed for the selective building block.

A photosensitizer is a molecule that can be able to produce a chemical change to the other molecule in the photochemical process. They are commonly used in polymer chemistry, especially in reactions like photopolymerization, photodegradation, and photocrosslinking. The photosensitizers come from three different families. They include porphyrin, dyes, and chlorophylls. The best photosensitizers possess the ability, to a lesser or greater degree, to target a specific tissue to achieve ablation (Ron, Gordon, and Rosa 36). The photosensitizers developed by every family possess a unique property that has minimal benefits for the clinic. The treatment of cancer by the PDT follows a series of steps where a photosensitizer agent is injected into the bloodstream. The agent is then absorbed by the cells of the body, but it stays in cancer-affected cells longer than in normal cells. The moment the agent has left all the normal cells, the tumor is exposed to light (Wilson). The photosensitizer found in the tumor will absorb light and then produce the active form of oxygen that is responsible for destroying nearby cancer.

Application/ Use Of Metalloporphyrins

Metalloporphyrin is essential in the coating of the material for the quartz microbalance-based chemical sensors (QMBs). As far as the optimization is concerned in the QMBs, it has been found that a minimum of fifty metalloporphyrins is needed to modify the quartz microbalance sensor so that it can obtain maximum sensitivity. The other use of metalloporphyrin is in medical imaging. The structure of the tetrapyrrolic is essential in facilitating rapid chelation in mild conditions to improve the solubility of water and allow the conjugation of the targeted groups and the molecular structure. The same emphasis is also applicable to metalloporphyrin, which is a clinically relevant imaging method that includes magnetic resonance imaging, radio imaging, fluorescence imaging, and photoacoustic and Raman imaging (Francesca and Ross 180).

It is certain that metalloporphyrins like the SNPP have been sent to the labs to be tested as drugs that can be used for the treatment of neonatal jaundice. Thus, it is a higher priority to market it to hospitals and other healthcare sectors as a treatment drug if approved. Metalloporphyrin serves as the SOD mimetics required to combat oxidation stress and also a wide range of the metalloporphyrin complexities that have been established as a form of contrast agent needed for magnetic resonance imaging.

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