Antimicrobial Photodynamic Activity of Phthalocyanine Derivatives

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Abstract

Microbial pathogens have increasingly shown multidrug resistance posing a serious threat to the public health. Advances in technology are opening novel avenues for discovery of compounds that will mitigate the ever-increasing drug-resistant microbes. Use of photodynamic photosensitizer is one of the promising alternative approaches since they offer low risk of bacteria resistance as they use generated reactive oxygen species to kill the microbes. Phthalocyanine (Pc) is one such photosensitizer which has already shown promising antimicrobial photodynamic therapeutic properties. Previous studies have shown effectiveness of the Pc against Gram-positive bacteria. However, its effectiveness toward Gram-negative bacteria is limited by the impermeability of the bacteria's outer membrane which is made up of lipopolysaccharides layer. The effectiveness of this photosensitizer is determined by its photophysical and photochemical properties such as singlet/triplet lifetimes, singlet oxygen quantum yields, and fluorescence quantum yield. Therefore, this review focuses on the recent significance advances on designing Pc that have this improved property by either conjugating with nanoparticles, quantum dots, functional groups in peripheral position, considering effect of cationic charge, and its position on the macrocycle.

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