**An overview on PDT and its new approaches in biomedicine**

**Khatereh Khorsandi**

1. Department of Photodynamic, Medical Laser Research Center, Yara Institute, ACECR, Tehran, Iran
2. Department of Biochemistry and Molecular Medicine, School of Medicine and Health Sciences, The George Washington University, Washington, DC 20037, USA

**E-mail**: Khorsandi.kh@ut.ac.ir& Biochem.kh@gmail.com

Photodynamic therapy (PDT) is a minimally invasive therapeutic modality that has gained great attention in the past years as a new therapy for cancer treatment and bacterial resistance. PDT uses photosensitizers (PS) that, after being excited by light at a specific wavelength, react with the molecular oxygen to create reactive oxygen species in the target tissue, resulting in cell death. Compared to conventional therapeutic modalities, PDT presents greater selectivity against tumor cells, due to the use of photosensitizers that are preferably localized in tumor lesions, and the precise light irradiation of these lesions. Antimicrobial photodynamic therapy (aPDT) has shown remarkable activity against bacterial pathogens in both planktonic and biofilm forms. There has been little or no resistance development against antimicrobial photodynamic therapy. Furthermore, recent developments in therapies that involve PDT in combination with chemotherapy, photothermal hyperthermia therapy, magnetic hyperthermia therapy, antibiotic chemotherapy, cold atmospheric pressure plasma therapy and using nanotechnology have shown additive and synergistic enhancement of its efficacy. The future path on the research of new photosensitizers with enhanced tumor selectivity and great potential to overcome the bacterial resistance associated with bacterial biofilm formation, featuring the improvement of PDT effectiveness, has been addressed in our research.

**Keywords:** PDT mechanisms, new photosensitizers, PDT tumor treatment, antimicrobial PDT, non-oncologic applications of PDT, PDT in medical devices