دومین کنگره پلاسما پزشکی ایران
The 2nd Congress on Plasma Medicine
DECEMBER 11-12,2025
۲۱ و ۲۰ آذر ماه ۱۴۰۴
دبیرخانه دائمی کنگره پلاسما پزشکی ایران
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# Cold Plasma Combination Photodynamic Therapy for Biomedical Therapy

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**OPEN ACCESS**

**Citation:**
Shirkavand A, Ataie Fashtami L. Cold Plasma Combination Photodynamic Therapy for Biomedical Therapy. *Iran Biomed J.* Supplementary (2-2026): 47.



**ABSTRACT**

**Introduction:** Cold atmospheric plasma (CAP) has recently emerged as a novel approach for cancer treatment as well as photodynamic therapy (PDT). The produced ionized gas (such as helium) generates unique combinations of reactive oxygen and nitrogen species (RONS). Over a decade ago, these plasmas, started to be explored for medical therapy, yet at that time, there was limited research on the mechanistic redox chemistry or biomedical implications of this topic.

**Materials and Methods:** The effectiveness of these two techniques, both separately and in combination, has been examined. The study analyzed the cell-killing rates among different study groups (i.e., control, CAP, PDT, and the combined technique (PDT and CAP) on cancerous human cells.

**Results and Discussion:** The results from treating cancer cells with CAP are promising. Due to the potential of this technique, it is essential to establish a mechanistic link between plasma physics (how and which plasma-derived ROS are produced) and therapy (what is the medical benefit). Additionally, the combination treatment of PDT and CAP showed enhanced effects compared to either PDT or CAP used alone.

**Conclusion:** The combined technique appears to be a promising method for treating cancerous cells, which are accessible to both light and CAP (e.g. skin cells). Moreover, applying a photosensitizer (e.g. ALA) before CAP therapy could enhance the overall treatment process.

*Keywords:* Cancer, Cold plasma, Photodynamic therapy, Redox, ROS

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