



生体内で利用可能な非平衡大気圧プラズマ照射装置の研究開発

Development of a Non-equilibrium Atmospheric Pressure Plasma Irradiation Device for in vivo Cancer Treatment

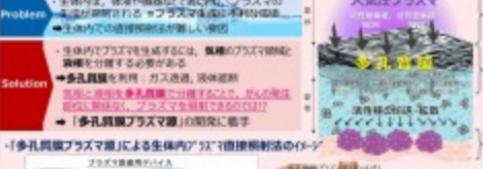
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[ABSTRACT] がん細胞への非平衡大気圧プラズマ照射は、新たな低侵襲がん治療法として期待されているが、体液や臓器などで満たされた生体内では、プラズマ生成に不利な環境である。本研究では、**生体内**フラズマ直接照射法の開発¹⁾、**多孔質膜**を用いて液相と気相を分離し、生体内のがん細胞の部位にようらず、**プラズマ**を照射できる**「多孔質膜**プラズマ源²⁾の研究³⁾を実施する。多孔質膜を介して、気相から液相に輸送された**活性酸素種**(ROS)をK1チブン法により確認し、また、ヒト肝芽球由来細胞Hep G2に対して、多孔質膜を通して活性酸素種が細胞死を誘導することが明らかとなった。今後、多孔質膜での化学反応と活性種の輸送・拡散機構の解明⁴⁾および、がん細胞凝集体(スフェロイド)に対する不活性効果の検証・作用機序の解析を行っていく。



生体内で利用可能な「多孔質膜プラズマ源」の開発 2



<利点>

- プラズマ中の活性種を生体内のがんに直接照射
- ガス側などを用いて、プラズマ活性種を体内に挿入
- 高効率の活性種照射である

「多孔質膜プラズマ源」の開発



活性種の検出: ROS, H₂O₂, NO



実験装置

● パルス周波数: 10Hz ~ 500Hz
● APG-005-500P: 500Hzまで、生細胞生存率100%
● 放電管: D = 190mm
● K1-チブン法: 0.25% (DMSO), 0.3% (Gentamycin), 1% (L-Glutamine), 5% (胎牛血清), 0.75% (Pen/Strep)

● 活性化温度: O₂: 100°C ~ 200°C
Ar: 200°C
O₂: 230°C
H₂O₂: 178°C
Hypochlorous acid: 0.1~20%

● H₂O₂検出試薬: Amplex Red試薬
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