PLASMA JET SELECTIVITY ON BONE CANCER CELLS AND LIQUID-MEDIATED EFFECTS

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Current therapies for bone cancers - either primary or metastatic - are difficult to implement and unfortunately not completely effective. An alternative therapy could be found in cold plasmas generated at atmospheric pressure which have already demonstrated selective anti-tumor action in a number of carcinomas and in more relatively rare brain tumors [1]. However, to the best of our knowledge, its effects on bone cancer are still uninvestigated in the literature [2]. Herein, we employed an atmospheric pressure plasma jet (APPJ) with helium to investigate its potential selectivity towards three different osteosarcoma cell lines (SaOS-2, MG63 & MC3T3) vs. different healthy cells (pluripotent or from either bone or connective tissue).As the effects of plasmas might be mediated by liquids, we characterized the gas phase of the plasma, as well as its effects on the generation of certain Reactive Oxygen and Nitrogen species (RONS) in liquid medium (cell culture medium) at different treatment times. The cytotoxic effects of the direct APPJ treatment were compared to its indirect interaction when only liquid medium was treated and subsequently added to the cells. In general, the cytotoxicity following direct treatment of bone cancer cells with APPJ was comparable to the indirect interaction through plasma-treated medium, especially on the long-term. Moreover, certain treatment conditions lead to progressive bone cancer cell death through apoptosis, as recorded by flow cytometry analysis, with alterations in the cell morphology, among others (Figure 1), while bone healthy cells remained viable and essentially unaffected by the treatment. The high efficiency of the indirect treatment points out to the important role played by the RONS which are then transmitted to the liquid phase, which overall lead to lethal and selective action towards osteosarcoma cells. These findings open new pathways for treatment of metastatic bone disease with a minimally invasive approach.

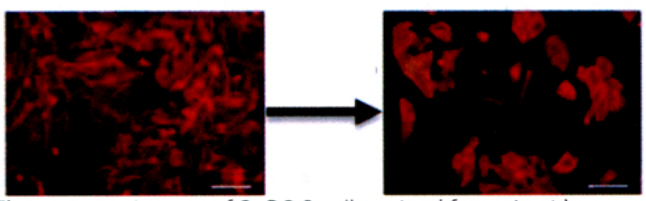

Figure 1 Fluorescence images of SaOS-2 cells stained for actin either untreated (left) or after 3 days in contact with APPJ-treated cell culture media (right).

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References

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