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Application of dental pulp stem cells as anticancer drug transporters for chemotherapy

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Understanding the mechanism and behavior of the stem cells and tracking them to check their efficacy in cancer treatment is essential for assessing their future clinical potential. Dental pulp is an interesting source of MSC due to the large abundance of cells and the non-invasive isolation compared to other adult tissue sources. In our study, we evidently proved that mesenchymal stem cells of the dental pulp (DPSC) can be loaded *in vitro* with PTX without affecting their viability, and could release the drug in time-dependent manner to the culture medium of cultivated cancer cells. Confocal Raman microscope is one method able to trace drugs inside living cells without the need for labeling. Drug uptake and apoptosis of tumor cells, without any direct contact with PTX, was identified by Confocal Raman Microscopy. This is essential for understanding the mechanism of action permitting the cell to uptake high concentrations of PTX without undergoing

apoptosis. Here we used stem cells of the dental pulp (DPSC) to assess for the first time their anti-cancer delivery potential. We were able to detect drug uptake by DPSCs, and to monitor the cytotoxic damage induced in breast cancer cells (MCF-7) by the Paclitaxel released *in vitro* from DPSCs. We checked the viability of DPSC by means of confocal Raman microscope and by cytotoxicity tests. The capability of stem cells to restore the tissue damage by cancer, after delivering the drug, was also inquired. In a second hand, quantitative images of intracellular drug uptake in DPSC and cancer cells were obtained by Raman microscopy. Application of stem cells for targeted drug delivery to cancer cells is an alternative option to reduce the morbidity caused by chemotherapy and to increase the efficacy of systemic cancer treatments.

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