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# A Review of Commercially Available Point-of-Care Devices to Concentrate Bone Marrow for the Treatment of Osteoarthritis and Focal Cartilage Lesions.

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**Abstract**

Objective Mesenchymal stem cells (MSCs) are a promising cell-based therapy treatment option for several orthopedic indications. Because culture expansion of MSC is time and cost intensive, a bedside concentration of bone marrow (BM) aspirate is used as an alternative. Many commercial systems are available but the available literature and knowledge regarding these systems is limited. We compared different point-of-care devices that concentrate BM (BMC) by focusing on technical features and quality parameters to help surgeons make informed decisions while selecting the appropriate device. Methods We compared published data on the BMC devices of Arteriocyte, Arthrex, Celling Biosciences, EmCyte, Exactech, ISTO Tech, Harvest Tech/Terumo BCT, and Zimmer/BIOMET regarding technical features (centrifugation speed/time, input/output volume, kit components, type of aspiration syringes, filter usage) and quality parameters of their final BMC product (hematocrit, concentration of platelets and total nucleated cells, concentration of MSC and connective tissue progenitor cells). Results The systems differ significantly in their technical features and centrifugation parameters. Only the fully automated systems use universal kits, which allow processing different volumes of BM. Only the Arthrex system allows selection of final hematocrit. There was no standardized reporting method to describe biologic potency. Conclusions Based on the data obtained in this review, recommending a single device is not possible because the reported data could not be compared between devices. A standardized reporting method is needed for valid comparisons. Furthermore, clinical outcomes are required to establish the true efficacy of these systems. We are conducting additional studies for more careful comparison among the devices.

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# Dental pulp stem cells used to deliver the anticancer drug paclitaxel.

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**Abstract**

*BACKGROUND:*

Understanding stem cell behavior as a delivery tool in cancer therapy is essential for evaluating their future clinical potential. Previous in-vivo studies proved the use of mesenchymal stem cells (MSCs) for local delivery of the commonest anticancer drug, paclitaxel (PTX). Dental pulp is a relatively abundant

noninvasive source of MSCs. We assess dental pulp stem cells (DPSCs), for the first time, as anticancer drug carriers. Confocal Raman microscopy is a unique tool to trace drug and cell viability without labeling.

*METHODS:*

Drug uptake and cell apoptosis are identified through confocal Raman microscope. We traced translocation of cytochrome c enzyme from the mitochondria, as a biomarker for apoptosis, after testing both cancer and stem cells. The viability of stem cells was checked by means of confocal Raman microscope and by cytotoxicity assays.

*RESULTS:*

In this study, we prove that DPSCs can be loaded in vitro with the anticancerous drug without affecting their viability, which is later released in the culture medium of breast cancer cells (MCF-7 cells) in a time-dependent fashion. The induced cytotoxic damage in MCF-7 cells was observed consequently after PTX release by DPSCs. Additionally, quantitative Raman images of intracellular drug uptake in DPSCs and MCF-7 cells were obtained. Cytotoxic assays prove the DPSCs to be more resistant to PTX as compared to bone marrow-derived MSCs, provided similar conditions.

*CONCLUSIONS:*

Applications of dental stem cells for targeted treatment of cancer could be a revolution to reduce morbidity due to chemotherapy, and to increase the efficacy of systemic cancer treatment.