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Study of potential differentiation of Wharton's jelly-derived umbilical cord-mesenchymal stem cells into renal tissues

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Developing effective stem cell-based therapies requires complex isolation of stem cells for in vitro culture systems, for accurate representation of the physiological stem cell niche. Even though bone marrow remains to be the gold standard for mesenchymal stem cells (MSCs) isolation, it is still considered a very invasive procedure. In an attempt to identify potential alternative MSCs sources for therapeutic applications, we studied MSCs derived from Wharton's Jelly of Umbilical Cord (WJ-UC) being an easy accessible source. We investigated their potency for *in vitro* expansion and differentiation into renal cells by comparing the usage of different cocktails as nephrogenic growth factors and basal medium as control. MSCs were isolated from 6 human UCs and further immunophenotyping using immunocytochemistry and CD29 expression flow cytometry were performed. *In vitro* expansion and differentiation of these isolated cells into renal progenitor stem cells was performed by adding separately 5 different nephrogenic growth factor cocktails and basal medium, then assessing and comparing the outcomes through investigating their differentiation capacities. The WJ-UCs isolated MSCs, showed significant positive expression of the MSCs surface marker, CD29. After expansion and induction of differentiation, results revealed that using nephrogenic growth factors cocktail containing a combination of Retinoic acid + Activin-A, then further adding of bone morphogenetic proteins (BMP-7), gave the highest significant positive expression of renal progenitor stem cell surface markers CD24 and CD133 using immunocytochemistry and flow cytometry. WJ-UC seems to be a promising source alternative to BM-MSCs, since they can be easily accessible, without any ethical concerns and are considered as a medical waste. After *in vitro* expansion and differentiation, using appropriate studied growth factors cocktail, newly formed renal progenitor stem cells may be further utilized by infusion or injection, opening new perspectives for cell-based therapies in patients suffering from renal diseases.

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