



Virtual reality in stem cell to tissue regeneration.

Advance case study of Microvesicles derived from stem cells for tissue regeneration.

Mesenchymal stem cells (MSCs) can stimulate regeneration of several tissues /organs after injury. Microvesicles (MVs) derived from MSC is one type of mechanism may be a involved in tissue regeneration. MVs include a heterogeneous population of vesicles released as exosomes from the endosomal compartment or as shedding vesicles from the cell surface of different cell types. MVs participate in cell-to-cell communications and regulate many cellular processes including proliferation, migration and differentiation by transfer of proteins, bioactive lipids, nucleic acids and other molecules from one cell to another. Therefore, MVs may transfer from stem cells to target cells critical information that may serve for tissue regeneration after injury.

MVs could carry several types of receptors and surface molecules including TF, TNF, MHC Class I/II, CCR5 chemokine receptor. Through these molecules MVs can interact with the target cell in a juxtacrine fashion, thereby activating the target cell. One of the most important step in the development pathway which involves Notch signaling can be performed through MVs, because MVs express delta like 4 (Dll4), a transmembrane Notch ligand. Therefore, MVs activate angiogenesis (formation of new vessels).

MVs derived from stem cells are able to reprogram target cells, for example hematopoietic progenitors, and endothelial cells suggesting that MVs are a stem cell instrument for tissue development regulation, regeneration, and cell differentiation. MVs derived from stem cells may be one of the crucial components supporting self-renewal and expansion of stem cells in the niche. MVs released from MSC are capable to increase pluripotency of hematopoietic progenitors by delivering RNA and proteins. MVs adhere to target cells, fuse with them, deliver their content into the cytoplasm and the carried mRNAs are translated into proteins by the recipient cells. Thus, MVs regulate tissue regeneration and renewal of injured cells.

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