INNOVATION

Wharton's Jelly Mesenchymal Stem Cell-Derived Exosome

The leading source of Exosomes

By Sean Vandersluis, PhD

Mesenchymal stem cells (MSCs) have emerged as a promising cellular therapy due to their immunomodulatory, regenerative, and anti-inflammatory properties.[1]

The therapeutic efficacy of MSC-based interventions is strongly influenced by the tissue source from which the cells are derived. The available sources include bone marrow and adipose tissue, but MSCs isolated from Wharton's jelly of the umbilical cord are increasingly regarded as the optimal source for clinical applications with superior efficacy.[2]

Unlike sources that require invasive procedures, such as bone marrow aspirations, Wharton's Jelly is collected from umbilical cords after childbirth, a tissue that is normally discarded. This makes WJ-MSC harvesting both noninvasive and ethically sound.[3]

"...Wharton's Jelly is collected from umbilical cords after childbirth, a tissue that is normally discarded..."

Wharton's jelly-derived MSCs (WJ-MSCs) offer several biological advantages linked to their perinatal origin. Unlike adult tissue-derived MSCs, WJ-MSCs are developmentally younger, exhibiting higher proliferative capacity, longer telomeres, and reduced cellular senescence during in vitro expansion.[4,5] These characteristics enable the generation of clinically relevant cell numbers with fewer passages, preserving functional potency and reducing the risk of culture-induced alterations.

Limiting in vitro expansion is particularly important because prolonged culture is known to increase the risk of genomic instability and phenotypic alterations that may compromise therapeutic safety and consistency.[6] By reaching therapeutic yields earlier, WJ-MSCs reduce exposure to these culture-associated stresses and, thereby, lower the likelihood of acquiring DNA alterations or transformation-associated changes. Furthermore, WJ-MSCs show less donor-to-donor variability, supporting batch consistency and reproducibility, which are critical for clinical application.[6]

Importantly, the secretome of WJ-MSCs is exceptionally rich in the bioactive compounds required for MSC therapies to induce regeneration, including growth factors, cytokines, proteins, and regulatory nucleic acids. A comparative proteomic study revealed that WJ-MSC exosomes contain hundreds of functionally significant proteins at higher abundance than exosomes derived from other MSC sources, contributing to their superior capabilities.[3,7]

Another advantage of WJ-MSCs is their low immunogenicity, as they naturally lack or underexpress key costimulatory molecules that typically trigger immune activation in recipient patients. This allows for allogeneic use with a reduced risk of immune rejection.[8]

These key advantages associated with WJ-MSCs are critical to the success of off-the-shelf MSC-based therapies and mark them as a key source of MSCs for treatment of a wide variety of diseases and conditions.

Dr. Sean Vandersluis earned his PhD in Biochemistry from McMaster University in 2024, where he investigated how stem cell biology underlies cancer progression. His research led to the discovery of novel therapeutics targeting cancer stem cells and the development of a personalized medicine platform based on cancer stem cell biology. To learn more, go to www.NuvoCellBiologics.com

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