Dynacell Life Sciences, LLC

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Technical Bulletin

Human Umbilical Cord Blood Mesenchymal Stem Cells

Introduction

Over the past decade, umbilical cord blood has emerged as a rich source of various stem and progenitor cells. More recently, umbilical cord blood has been identified as an abundant source of mesenchymal stem cells (MSCs) (1-3). Of all the cell types isolated from cord blood, mesenchymal stem cells are the most clinically relevant in terms of the numbers of clinical trials in which they are being utilized (1,2). Successful animal trials involving the repair and reconstitution of bone, cardiac muscle, cartilage and connective tissue have made these cells crucial for novel tissue repairs and engineering solutions (4).

Mesenchymal stem cells are a unique cell type that have the capacity to differentiate into a variety of non-hematopoietic cells. To date, it has been demonstrated that mesenchymal cells can give rise to adipocytes, skeletal myocytes, cardiac myocytes, hepatocytes, osteocytes, chondrocytes, dermal cells, tendons, and marrow stromal cells. A visual representation of some of the lineages derived from mesenchymal cells is shown below in figure one.

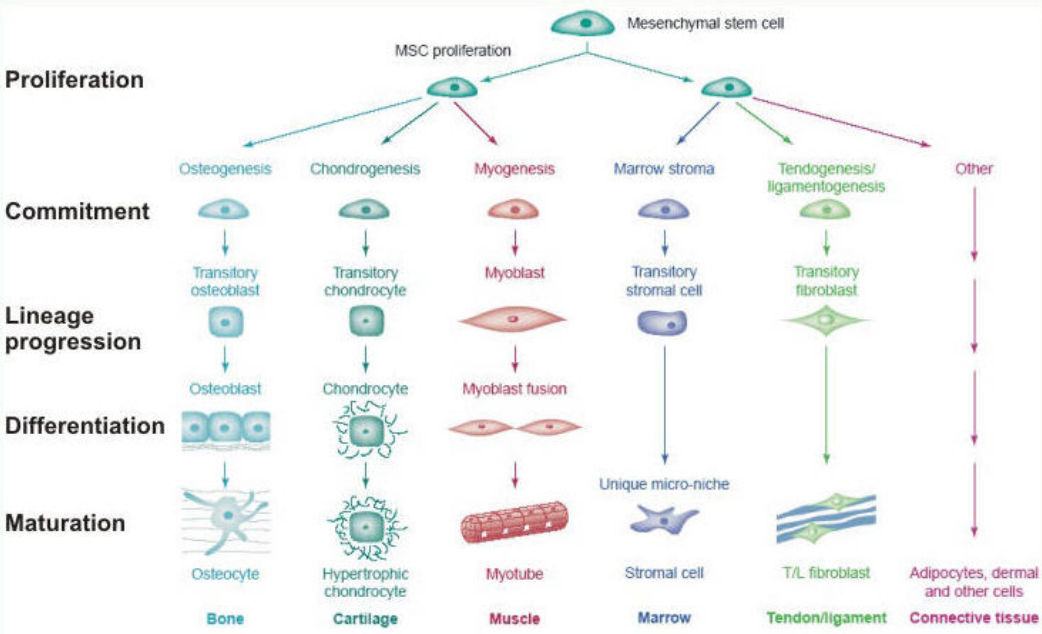

Figure 1: *A few of the cell lineages derived from mesenchymal cells.*

Unlike MSCs isolated from bone marrow, cord blood derived MSCs are relatively easy to induce osteogenic and chondrogenic differentiation (5). This characteristic makes these cells an ideal

candidate for the cellular component of bone and cartilage tissue engineering. Recent reports from various groups demonstrate that seeding MSCs onto a bioscaffold, either natural or biosynthetic, offers a microenvironment that is easy to manipulate and maintain as a source of growing and expanding MSCs.

In addition to an emerging role in tissue engineering, MSCs are becoming a valuable tool for genetic engineering, therapy and manipulation (4). Many of the recent studies involve the transfection of these cells with genes for different growth factors. A variety of vector systems can be used to introduce a biologically active gene of interest, resulting transduction of the cell. Based on appropriate selection criteria, the transduced cells can be expanded *in vitro* and subsequently transplanted into a host. The long-term goals for this type of work are the transduction of specific cell populations and transplantation resulting in sustained and localized tissue change, repair and growth.

Cell Surface Markers

Umbilical cord bloods MSCs are positive for CD105, CD166, CD29 and CD44. These cells are negative for CD14, CD34 and CD45.

Product Disclaimer

These products are for research use only. Dynacell MSCs are approved for human or veterinary use, for application to humans or animals, or for use *in vitro* diagnostic or clinical procedures.

The most common source of human cord blood utilized for the isolation of cells are units collected and consented for scientific research but not for transplant. As a matter of procedure, all units have had corresponding maternal blood tested for Human Immunodeficiency Virus type 1 and 2, Hepatitis B virus, Hepatitis C virus, Human T-cell lymphotropic virus types I and II, *Treponema pallidum* and Cytomegalo Virus. Each lot has tested negative for bacterial, viral and fungal contamination. Although these cells have been pathogen tested, always treat human sourced materials as potentially infectious. As a matter of safety, human based products should always be handled at BSL-2 levels or higher.

Product Guide

Catalog Number	Product Description	Aliquot
26-1001-20	Human Umbilical Cord Mesenchymal Cells	750,000 cells
26-1001-22	Human Umbilical Cord Mesenchymal Cells	5 x 750,000 cells

References

1. Chang,Y.J. *et al.*, Cell Biol Int, 2006, 30:495.
2. Lee, M.W. *et al.*, Biochem Biophys Res Com, 2004, 320:273.
3. Miao, Z., *et al.*, Cell Biol Int, 2006, 30: 681.
4. Leo, A.J., *et al.*, Cells Tissues Organs, 2006, 183:112.
5. Markov, V., *et al.*, Stem Cells Dev, 2007, 16: 53.

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