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Current Status of Multipotent Mesenchymal Stromal Cells

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THIS SPECIAL ISSUE of the journal highlights the 16th US-Japan Cellular and Gene Therapy Conference entitled ''Potential Application of Multipotent Mesenchymal Stromal Cells'' held on the National Institutes of Health Campus on February 28, 2013. The conference was jointly organized by the Center for Biologics Evaluation and Research, US Food and Drug Administration (FDA), and the Ministry of Education, Culture, Sports, Science and Technology, Japan under the US-Japan Cooperative Research Program. The scientific themes of these joint annual meetings are selected based on current advances in the area of cellular and gene therapy. Speakers from Japan and the United States kindly agreed to submit their presentations for this special issue of the journal.

Mesenchymal stem cells (MSCs) (also known as multipotent stromal cells) were first isolated from bone marrow and found capable of regenerating rudiments of bone and supporting hematopoiesis *in vivo*.[1] Plastic adherent populations isolated from bone marrow were found to be functionally heterogeneous and exhibited colony-forming unit fibroblasts made up of undifferentiated stem cells and progenitor cells. These cells were also observed for their multipotency through differentiation into mesenchymal cell types, including osteoblasts, chondrocytes, and adipocytes. Because MSCs are generated from the stromal component of bone marrow, they were later renamed multipotent mesenchymal stromal cells (with the same acronym) to reflect their origin and biological properties.[2]

MSCs are a diverse population of cells with a wide range of potential therapeutic applications, which is evident from the variety of indications currently being investigated in clinical trials. Their potential is based on their inherent biological properties such as plasticity, proliferation, migration, self-renewal, and immunosuppression. A large number of clinical studies have been conducted or are ongoing. The FDA has not yet approved any MSC-based products.

These MSC-based products are complex and heterogeneous. The variability in donor and tissue sources, manufacturing processes, phenotypic cell markers, and bioactivity has the potential to significantly impact the product and prevents a direct comparison of therapeutic protocols. Bone marrow is not the sole source of MSC-based products; current research in the use of umbilical cord or placental tissue and adipose-derived MSC-based products has increased significantly.

In spite of numerous challenges and diversity in MSC-based clinical trial products, MSCs have great potential in the field of regenerative medicine. The articles in this issue highlight the promises and challenges in the manufacturing of MSCs and their use in bone tissue regeneration, cirrhosis treatment, and tissue vascularization.

Disclosure Statement

No competing financial interests exist.

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