



A Small Molecule-Based Culture System to Prevent Replicative Senescence and Promote Osteogenic properties of Mesenchymal Stem Cells

L. Liao¹, Y. Shuai², Y. Jin², Weidong Tian¹

¹West China Hospital of Stomatology, Sichuan University, China

²School of Stomatology, Fourth Military Medical University, China

Abstract:

Mesenchymal stem cells (MSCs) are promising candidates for oral tissue regeneration and disease treatment. However, long-term in vitro passing leads to stemness loss of MSCs, resulting in failure of MSCs therapy [1-2]. Here, we report a small molecule (SM)-based strategy to improve cell therapy of long-term cultured MSCs.

Firstly, we established a high-throughput screen system to isolate SM that could prevent senescence during long-term passing. After high throughput screening, four SMs that efficiently prevented replicative senescence of MSCs were isolated. The formula of SM was efficient to preserve self-renewal and differentiation properties of rat bone marrow MSCs after long-term passing. SM treatment did not affect the colony forming, proliferation and osteogenic differentiation of MSCs cultured for 1 or 4 passages, but largely prevented the decline of self-renewal and differentiation capacity of MSCs cultured for 15 passages in vitro. Furthermore, heterotopic osteogenesis assay, critical size calvarial defects repair assay, and osteoporosis treatment assay strongly certified that melatonin preserved the therapeutic effect of long-term passaged MSCs on bone regeneration in vivo. Mechanistically, the SM formula functioned by activating antioxidant defense system, inhibiting the pathway of cell senescence, and preserving the expression of gene governing the stemness. In conclusion, the small molecule formula efficiently prevents the dysfunction and therapeutic failure of MSCs after long-term passing, providing a practical strategy to improve the application of MSCs in tissue engineering and bone regeneration.



Biography:

Li Liao is an associate professor in State Key Laboratory of Oral Disease, West China Hospital of Stomatology, Sichuan University in China. His research focused on the molecular mechanism of the dysfunction of mesenchymal stem cells (MSCs) and MSCs-based therapeutic strategy for hard tissue regeneration. He has published 11 SCI articles as first author or corresponding author, and 10 SCI articles as coauthor in the recently 5 years. These articles were published in international journals including *Theranostics*, *Stem Cells*, *Molecular Therapy*, et al. His articles have been cited for more than 800 time and with a H-index of 15. He was the director of a National Key Research and Development Program of China and a program of Nature Science Foundation of China. He was elected as the Committee of the Association of Tissue Engineering and Regenerative Medicine in China.

Publication of speakers:

1. Li Liao et al, "Deciduous autologous tooth stem cells regenerate dental pulp after implantation into injured teeth", *Sci Transl Med*, Aug 22;10(455):eaaf3227, 2018.
2. Li Liao et al, "MSC-Derived Exosome Promotes M2 Polarization and Enhances Cutaneous Wound Healing", *Stem Cells Int*, Sep 9;2019:7132708, 2019.

European Summit on Dental and Oral Health | March 19-20, 2020 | London, UK

Citation: L. Liao; A Small Molecule-Based Culture System to Prevent Replicative Senescence and Promote Osteogenic properties of Mesenchymal Stem Cells; Euro Dental 2020; March 19-20, 2020; London, UK