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Guest Editorial

Stem Cells in Deciduous Teeth – Their Potential use in Medicine

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The potency and quality of adult stem cells in our body is reversely proportional to our age. When stem cells were discovered in deciduous teeth, it has drawn much attention to the dental and medical fields. Because these cells are normally from children shedding teeth around ages 6-12, they are relatively more immature stem cells. The isolated stem cells from the pulp of deciduous teeth were named SHED (stem cells from exfoliated deciduous teeth) [1]. As other dental stem cells, SHED are a type of typical mesenchymal stromal/stem cells (MSCs) expressing CD146, CD105, CD73, CD29 and CD44; as well as expressing embryonic stem (ES) cell markers OCT4, NANOG, stage-specific embryonic antigens (SSEA-3, SSEA-4) and tumor recognition antigens (TRA-1-60 and TRA-1-81) [2]. They have a relatively high population doubling (>140) and can form sphere culture and expand in a manner similar to neurospheres formed by neural stem cells [1]. The characterization of these cells were quite extensive in this first report. Cells were induced into neural lineages and injected into the mouse brain and found to have survived and expressed neural markers. Since then, SHED have been extensively studied for their various potential: osteogenic potential for bone regeneration [3,4], chondrogenic differentiation for cartilage repair [5], muscle cell differentiation to treat muscular dystrophy [6], neural differentiation to repair spinal cord injury [7], dopaminergic differentiation for Parkinson's disease [8], differentiation into corneal epithelium for ocular surface regeneration [9], renotropic properties and attenuation of inflammation of damaged kidney [10,11], differentiation into hepatocyte-like cells [12], and treatment of autoimmune diseases such as lupus erythematosus for their immunosuppressive properties [13]. Such versatile potential marks SHED a highly attractive cell source for medical applications.

Since the report of the discovery of SHED in 2003, certain tooth banking companies have also emerged. Studies to test cryopreserving SHED have shown that these cells can recover after thawing and behave similarly to the non-cryopreserved counterparts [14]. When the deciduous

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tooth was cryopreserved and later thawed to isolate SHED, the cells also behave similarly compared to their counterparts [15]. The other report studied showed that cells isolated from cryopreserved intact primary teeth had morphological changes with lower culture rates and proliferation potential [16]. Besides SHED, there are also periodontal ligament cells from deciduous teeth (dePDLSCs) that have been isolated and characterized. Compared to the same cell type from permanent teeth (pePDLSCs), both are typical MSCs having similar characteristics [17]. dePDLSCs appear to be more proliferative and osteogenic while pePDLSCs secrete more neurotropic factors [18,19]. Overall, less studies have been reported on dePDLSCs, although they also present as a viable cell source for regenerative applications.

While these MSCs from deciduous teeth have shown much promise in their medical applications, reported studies so far have been only tested in animal models. Human trials using these cells have yet to be reported. Regarding banking deciduous teeth, most tooth banking companies cryopreserve primary teeth instead of isolated cells because higher cost is involved if to culture SHED or dePDLSCs that are to be clinically used in the future. All the reagents involved that are in contact with cells for clinical use will be highly regulated and inspected.

From the perspective of obtaining SHED, the sources are quite available as everyone sheds one's deciduous teeth which can be collected for cell isolation. Studies have shown that even carious deciduous teeth can yield viable SHED [20]. One shortcoming is that although SHED have a high population doubling and can be cultured to many passages to expand the cell number for therapeutic use, ultimately there is still a limitation. Alternatively, SHED can be reprogrammed into induced pluripotent stem cells which are similar to embryonic stem cells. These cells can yield a large number of cells for even border range of medical applications [21].

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