

Policy on Using Harvested Dental Stem Cells

Latest Revision

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Purpose

The American Academy of Pediatric Dentistry (AAPD) recognizes the emerging field of regenerative medicine and encourages dentists to follow evidence-based literature in order to educate parents about the collection, storage, viability, and use of dental stem cells with respect to autologous regenerative therapies. The AAPD also recognizes that harvested dental stem cells is an emerging science which may have application for oral health care but, at present, there are no treatments available using harvested dental stem cells in humans. This policy is related to the use of harvested dental stem cells from a tooth or follicle.

Methods

This policy was developed by the Council on Clinical Affairs, adopted in 2008¹, and last revised in 2017². This revision included a review of current dental and medical literature and sources of recognized professional expertise related to dental stem cells. A literature search of the PubMed®/MEDLINE database was conducted using the terms: dental stem cell, harvested tooth cell; fields: all; limits: within the last 10 years, humans, English, birth through age 99, resulting in 151 papers that were reviewed by title and abstract. Papers for review were chosen from this list and from the references within selected articles. Expert and/or consensus opinion by experienced researchers and clinicians was also considered.

Background

Stem cells are pluripotential cells that can divide and multiply for an extended period of time, differentiating into a diverse range of specialized cell types and tissues. Dental stem cells are a minor population of mesenchymal stem cells (MSCs) existing in specialized dental tissues, such as dental pulp, periodontium, apical papilla, and dental follicle.^{3,4} Numerous types of stem cells have been isolated from dental tissue, such as dental pulp stem cells (DPSC), stem cells isolated from human pulp of exfoliated deciduous teeth (SHED cells), periodontal ligament stem cells (PDLSC), stem cells from apical papilla (SCAP), and dental follicle cell. All these cells can regenerate the tissue of tooth to provide theoretical basis for clinical treatments.^{5,6} DPSC have received special attention because they represent a readily accessible source of stem cells. Their high plasticity and multipotential capacity to differentiate and produce a variety of dental tissues can be explained by its neural crest origin, which supports

applications beyond the scope of oral tissues.⁷ Stem cells used for regenerative endodontics and scaffolding have shown successful regeneration in laboratory and animal studies.⁸⁻¹⁰ Dental stem cells-based regenerative medicine provides the possibility to repair damaged dental tissues or generate new teeth.^{4,11} Clinical studies for pulpal regeneration and periodontal tissue generation using dental tissue-derived stem cells have been published, and evidence that these cells could be beneficial in therapies beyond oral tissues is growing.¹²

Due to their differentiation potential, oral-derived MSCs are promising for tissue engineering and regenerative medicine.^{11,13} The most familiar application of adult stem cell therapy is bone marrow transplantation to treat hematopoietic cancers, metabolic disorders, and congenital immunodeficiency syndromes. Dental stem cells with high potentials such as ability of self-renewal, MSCs characteristics, multilineage differentiation, and immunomodulation are promising tools for *in vitro* and *in vivo* differentiation studies as well as the therapy of immune-related diseases.¹⁴ Dental MSCs are not only easily accessible but are also expandable *in vitro* with relative genomic stability for a long period of time.¹⁵ Several preclinical studies and clinical trials have been performed using dental MSCs in the treatment of multiple ailments, ranging from dental diseases to nondental diseases¹⁵; these are a promising treatment alternative for neurological disease including stroke.¹⁶ Some clinical trials with dental MSCs have demonstrated the efficacy and safety of dental MSC-based therapy for oral diseases.¹⁵ Human exfoliated deciduous teeth stem cells have shown promise in an initial small safety-phase clinical trial for treating a non-dental disease.¹⁷

Parents may elect to preserve umbilical cord blood of their child for future harvesting of stem cells if autologous regenerative therapies are indicated. Pulpal tissue of exfoliating primary teeth, oral mucosa fibroblasts¹⁸, surgically removed third molars, periodontal ligament¹⁹, and gingival fibroblasts¹⁹ may serve as a source of mesenchymal stem cells.^{9,20}

The public is increasingly aware of this emerging science, and more parents are expressing interest in harvesting/banking dental stem cells. While sources of dental stem cells are readily accessible, those cells must be secured and stored properly

ABBREVIATIONS

AAPD: American Academy of Pediatric Dentistry. **DPSC:** Dental pulp stem cells. **MSCs:** Mesenchymal stem cells.

to maintain the potential to proliferate and differentiate.^{21,22} Ongoing clinical trials using human dental pulp stem cells may be searched using the web-based resources of the National Library of Medicine at the National Institutes of Health.²³

Policy statement

While no treatment using harvested dental stem cells in humans is currently available, the AAPD recognizes that this is an emerging science which may have application for oral healthcare. As the technology continues to evolve, the process of procurement of dental stems cells should be accomplished only with deliberate integrity and appropriate informed consent to assure the highest ethical standards and quality of outcomes.

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