Dental stem cells: Hope or hype?

Stem cells have been fascinating for scientists due to their ability to give rise to a highly specialized cell type or organism and their almost endless self-renewal potential. Research on stem cells is advancing our knowledge of how a whole organism develops from a single cell and how damaged cells get replaced by healthy cells in adult organisms. This promising area of science is also leading scientists to investigate the possibility of cell-based therapies to treat disease. Stem cell research and therapy present new hope as an exciting therapeutic option for patients, good future prospect for scientists, and new opportunity of profitable business for entrepreneurs. However, research on stem cells raises many ethical and scientific questions as rapidly as it generates new discoveries.

Stem cells are progenitor or precursor cells that are capable of self-renewal and multilineage differentiation. Stem cells can be broadly divided into embryonic, adult, and induced pluripotent stem cells. Embryonic stem cells are capable of multilineage differentiation. These are cells from inner cell mass of embryo that can give rise to whole organism. Adult stem cells are multipotent stem cells that can be derived from different kind of tissues such as umbilical cord, amniotic fluid, bone marrow, liver, cornea, pancreas, dental pulp, and adipose tissue. Induced pluripotent stem cells are engineered stem cells *in vitro* by morphogens or growth factors and a scaffold guide for cell growth.

Stem cells from oral or maxillofacial region contain mesenchymal stem cells. Different types of dental stem cells have been isolated and characterized. Depending upon the origin of cells, they are classified as dental pulp, exfoliated deciduous teeth, apical papilla, periodontal, and follicle progenitor stem cells.

This is an interesting time for dentistry professionals to see the dental stem cell research and therapy reaching new heights in the field of regenerative medicine. Advancements in the past years based on research in dental stem cells show immense potential in regenerative therapy not only for damaged dentin, pulp, periodontal, and whole tooth but also in repair of craniofacial defects. To translate stem cell therapy from laboratory to clinic, intensive research is needed in major areas. Autologous stem cells from patients are ideal for patient treatment as there is no immune rejection, but isolation and expansion are time-consuming; whereas preexisting allogenic cell lines and organ culture are good source, but immunological reactions remain a question. Similarly, tissue regeneration *in vitro* is a complex procedure involving not only culture conditions but also various signaling molecules for guiding cell growth and expansion and the need for a framework on which the tissue can grow. Significant research is needed to get clarity on role played by these molecules, their appropriate combination, and their sequence and time frame for predictable results. To generate whole organ structure, scaffold is prerequisite. They can be natural or synthetic, but fabrication of natural matrix structure requires extensive research for maintaining characteristics of stem cell, providing nutrients, and allowing appropriate differentiation.

Beside bone marrow transplantation, all other therapy that can be provided by stem cells is in infantile stage in laboratory and should not be considered for clinical use. Many clinical trials for assessment of effect of stem cells in heart disease, Parkinson's disease, spinal cord injury, and blindness are going on. Stem cells hold immense promises, but there are several technical hurdles that need to be crossed before transiting this novel therapy from laboratory to clinic. As it happens with any new discovery, a number

of companies are offering to bank the stem cells from cord blood or dental tissue for future use. However, we are not yet sure of their ultimate utility; hence, it will not be pertinent for medical fraternity to advice for this kind of private storage of stem cells, especially in resource-poor setting like ours. The need of the hour is collaboration between basic scientists and clinicians for development of simple, efficient, clinically feasible, and cost-effective therapeutic methods for patients who are the chief beneficiaries of this innovation.

Ashwin Dalal
Division of Diagnostics, Centre for DNA Fingerprinting and Diagnostics, 4-1-714, Tuljaguda Complex, Mozamzahi Road, Nampally, Hyderabad - 500 001, Telangana, India
E-mail: ashwindalal@gmail.com

Access this article online	
Quick Response Code:	Website: www.ijdr.in
	DOI: 10.4103/0970-9290.183118

How to cite this article: Dalal A. Dental stem cells: Hope or hype?. Indian J Dent Res 2016;27:113-4.