

Guest Editorial

Future Directions of Modern Dentistry: Dental-derived Stem Cells

Dentistry is going through a period of profound change. The old conception of the dentist collides with the modern view of dental science. The future challenges of modern dentistry have focused on regenerative medicine, with a particular interest on stem cells and biomaterials. Nowadays, it is very common to hear about stem cells and regenerative medicine; however, they are fairly recent concepts, therefore still not well understood. Moreover, they often create in the inexperienced reader several highly suggestive but unrealistic ideas, such as that stem cells are a kind of magical remedy that defies the laws of physiology and biology. Instead, it is important to have a correct point of view of regenerative medicine, particularly in the emerging field of regenerative dentistry. Stem cell research is a growing part of biomedical research aimed at regenerating damaged or lost tissues and organs.



Although the ability to self-regenerate shown by some tissues, such as the liver, was already reported in 460 BC by Aeschylus in the *Prométhéus desmótes*, the definition “Stammzelle”, the German translation of “stem cells” was reported in the scientific literature by Ernst Haeckel in 1868.

Maximow is commonly reported to be the first scientist of the modern age to discuss “stem cells” in a lecture held at a special meeting of the Berlin Hematological Society on June 1, 1909; however, the term “stem cell” has been used in earlier publications (Ramalho-Santos M, Willenbring H. On the origin of the term “stem cell”. *Cell Stem Cell*. 2007 Jun 7;1(1):35-8).

Starting from 1932, the query “stem cell” on PubMed, the most used scientific search engine worldwide accessing primarily the MEDLINE database of references and abstracts on life sciences and biomedical topics, shows over 169,000 scientific contributions on this topic. The impressive number of articles is rapidly growing with a particular boost over the recent years, proving the great interest of the scientific community on this subject.

Stem cells derived from a variety of sources are promising tools for cell therapy. Although stem cell therapy has opened a new horizon in regenerative medicine, there are still several obstacles that need to be overcome before this novel treatment tool can be used in a large scale in clinics. However, it is obvious that regenerative stem cell therapy has been transformed from scientific fiction into a feasible medical procedure. Regenerative stem cell therapy has created a lot of hopes amongst scientists and physicians to find more effective medical treatment procedures; nevertheless, it is essential for this new spectrum to develop further through high quality investigations and contributions of researchers and physicians and also advanced clinical trials that facilitate mesenchymal stem cells application in clinics and for therapy.

Recently, dental tissues have also been reported as an accessible source of mesenchymal stem cells, introducing the innovative and engaging topic of the dental-derived stem cell research (Mao JJ, Prockop DJ. Stem cells in the face: Tooth regeneration and beyond. *Cell Stem Cell*. 2012;11:291-301).

The pioneer of the study of dental-derived stem cells (DDSCs) is Stan Gronthos, who first described in 2000 the stem cells in dental pulp, defining them as dental pulp stem cells (DPSCs) (Gronthos S, Mankani M, Brahimi J, Robey PG, Shi S. Postnatal human dental pulp stem cells (DPSCs) in vitro and in vivo. *Proceedings of the National Academy of Sciences of the United States of America*. 2000;97:13625-30).

After the isolation of DPSCs, other dental and periodontal tissues have been found to be rich in stem cells, such as human exfoliated deciduous teeth (SHED), periodontal ligament (PDLSCs), apical papilla (SCAP) and dental follicle (DFSCs) (Tatullo M, Marrelli M, Paduano F. The regenerative medicine in oral and maxillofacial surgery: the most important innovations in the clinical application of mesenchymal stem cells. *Int J Med Sci*. 2015 Jan 1;12(1):72-7).

The future of dentistry is a challenge that must be accepted today. The dentist can no longer be a figure with skills limited to clinical or surgical branches related to the oral district. Future directions of modern dentistry

are leading toward dental-derived stem cells and the future of today is the past of tomorrow; therefore we must always be receptive to innovations and curious with respect to basic research.

Stefania Cantore DDS, MSOrth, MS Oral Surg
Visiting Senior Clinical Lecturer at BPP University
Faculty of Dentistry, Birmingham-United Kingdom