

# Application of Stem Cells in Dentistry & Endodontics

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### Introduction:

**R**egenerative medicine is a newly evolving branch of modern medicine that deals with cell based therapies which use healthy cells cultured in the laboratory to replace damaged cells in adult organisms to treat disease. Regenerative medicine aims to repair or regrow parts or tissues which are lost as a consequence of disease or injury. One of the building blocks of this therapy is stem cell<sup>1</sup>. Stem cells have the capability to multiply manifolds and convert or differentiate into any specialized cell types of the body. Hence, the potential of these invaluable assets could even be projected as far as, sometime in the near future, to replace organ transplantation.

### Properties of Stem Cells:

Stem Cells in a classic definition possess various properties:

- Unspecialized: One of the fundamental properties of a stem cell is that it does not have any tissue specific structures that allow it to perform specialized functions.
- Self-renewal: It is the ability of a cell to go through cycles of self division while maintaining the undifferentiated state, in other words, create new stem cells. These cells will have the capacity to nest in the recipient organism and continue to provide new generations of stem cells. An undifferentiated cell has the inner capacity of transforming themselves through differentiation into specific cells that will be needed to fulfil a function or create a structure; that is, to replace a damaged tissue and its function.

### Potency:

It is the capacity of a cell to transform itself (differentiate) into specialized cell types. This way the original stem cell can give rise to any mature cell type according to needs regulated by biochemical messages sent to the circulating stem cell.

### Stem Cells In The Endodontics:

**Regeneration of Pulp:** Regenerative

### Abstract:

A stem cell is capable of propagating and generating additional stem cells, while some of its progeny can differentiate and commit to maturation along multiple lineages giving rise to a range of specialized cell types. A stem cell can divide asymmetrically, in which one of the two daughter cells retains the stem cell characteristics while the other is destined for specialization under specific conditions. There are two broad categories of stem cells: embryonic and adult stem cells. Embryonic stem cells are derived from embryos. Adult stem cells of dental origin present themselves to be the best contenders for this process. Some of the common sources are dental pulp stem cells (DPSCs), periodontal ligament stem cells (PDLSCs), dental follicle progenitor stem cells (DFPCs) and stem cells from apical papilla (SCAPs)

### Keywords:

adult stem cells, stem cells of apical papilla (SCAP) endodontic procedures can be defined as biologically based procedures which are designed to replace damaged structures including dentin and root structures, as well as the cells of the pulp dentin complex

### These techniques are:

- Root canal revascularization via blood clotting.
- Post natal stem cell therapy.
- Pulp implantation.
- Scaffold implantation.
- Injectable scaffold delivery.
- Three dimensional cell printing.
- Gene therapy

### Root Canal Revascularization:

The revascularization method assumes that the root canal space has been disinfected effectively by the use of intracanal irrigants, with the placement of antibiotics for several weeks. Revascularization of necrotic root canal systems by disinfection followed by establishing bleeding into the canal system via overinstrumentation. An important aspect of these cases is the use of intracanal irrigants (NaOCl and chlorhexidine) with placement of antibiotics (e.g. a mixture of ciprofloxacin, metronidazole, and minocycline paste) for several weeks.

Post natal stem cell therapy: The simplest method to administer the cells of appropriate regenerative potential is to inject the post natal stem cells into the disinfected root canal systems after the apex is opened. The post natal stem cells can be derived from multiple tissues including skin, buccal mucosa, fat and bone.

Pulp implantation: In pulp implantation, the cultured pulp tissue is transplanted into cleaned and shaped root canal systems. The pulp tissue is grown in sheets in vitro on biodegradable polymer nanofibers.

Scaffold implantation: Pulp stem cells must be organized into a three dimensional structure that can support cell organization and vascularization. This can be accomplished by using a porous polymer scaffold which is seeded with pulp stem cells.

Injectable scaffold delivery: Tissue engineered pulp tissue is seeded into the soft three dimensional scaffold matrix, such as a polymer hydrogel. Hydrogel are injectable

scaffolds that can be delivered by syringe, they have the potential to be noninvasive and are easy to deliver into the root canal systems.

Three dimensional cell printing: The three dimensional cell printing technique can be used to precisely position cells and this method has the potential to create tissue constructs that mimic the natural tooth pulp tissue structure

### Conclusion:

The pursuit and production of knowledge through scientific research is an effort that offers enormous intellectual rewards for researchers while also performing an important social function. The advancement of science has transformed our lives in ways that would have been unpredictable just a half century ago. Stem cells have more roles to play in medicine and dentistry. The complete restoration of the physiologic, structural & mechanical integrity of the native tissue structure is a fascinating fact and it's a way far to reach the hands of mankind. Advances in adult stem cell biology have provided a great deal of impetus for the biomedical community to translate these findings into clinical application.

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