

## Review

# Teeth – as a life bank (stem cells in dentistry), review article

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### Abstract

**Stem cells are biological cells found in all multicellular organisms that can divide and differentiate into diverse specialized cell types and can self-renew to produce more stem cells. In our human body, there are many sources from which these stem cells are derived such as eye, brain, blood from umbilical cord, bone marrow, skin and teeth. These stem cells can be derived from embryonic, foetal and adult tissues and cultured to form other different cells for regenerative and therapeutic purpose.**

**Keywords:** Stem cells, Embryonic tissues, Foetal tissues, Adult tissues, Regenerative purpose.

## INTRODUCTION

Stem cells are undifferentiated primitive cells that have the capacity to divide and differentiate into specialized cells, which has more importance in the field of medicine. Stem cells are derived from embryonic, foetal and adult tissues. In adults bone marrow, fat, brain tissue, human exfoliated deciduous teeth (SHED), dental pulp (DPSCS), periodontal ligament (PDLSCS) are the major sources. Researchers believe stem cells are capable of providing treatment options in a wide variety of the diseases.

### History

The term stem cell was proposed by Russian histologist ALEXANDER MAKSIMOV in 1908 at congress of

hematologic society in Berlin. During early 1960's the Canadian scientists came out with the good results on stem cells. (Becker et al., 1963) In 1998 at the University of Wisconsin-Madison the first human embryonic stem cell line was derived. "New Stem-Cell Procedure Doesn't Harm Embryos, Company Claims". Fox News. <http://www.foxnews.com/story/0,2933,210078,00.html>

### Types of stem cells

The two broad types of stem cells are embryonic stem cells and adult stem cells. Embryonic stem cells are derived from embryos (cells from inner cell mass of blastocyst) (Shapiro al., et 1998). These cells has the capacity of forming all the 3 germ layers and able to develop more than 200 cell types. To derive the embryonic stem cells an embryo has to be destroyed, hence this has ethical problems.

Hence embryonic stem cells remain potential only

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Theoretically because of its abilities of unlimited expansion and pluripotency.

Adult stem cells can be found in the blood of umbilical cord, bone marrow and blood. Pluripotent stem cells that are found in the blood of umbilical cord are only few in number. These adult stem cells have been used for many years successfully to treat leukemia and bone\blood cancers through bone marrow transplantation.

### Stem cells in dentistry

In 2003 DR. SONGTAO SHI- a Pedodontist discovered baby tooth stem cells by using the deciduous teeth of his six year old daughter and he named them as stem cells from human exfoliated deciduous teeth (SHED).

Many researchers have been done on dental pulp looking for stem cells, and they found that dental pulp was rich in different stem cell types like chondrocytes, osteoblasts, adipocytes and mesenchymal stem cells.

These mesenchymal stem cells is one of the most potential stem cell which has wide therapeutic application (Chamberlain et al., 2007).

Dental pulp stem cells can be found both in children and adults (JJiang et al., 2002).

### Advantages of dental pulp stem cells

Unlike umbilical cord blood cells which have to be immediately collected at birth, dental stem cells are derived from milk teeth. Because there are 20 viable milk teeth that can be used for collecting stem cells. Dental stem cells are non-controversial Adult Stem cells. Viable stem cells are more and it is very simple to collect without morbidity and mortality.

### Sample selection criteria

#### Deciduous teeth

- (1) Pulp should be vital.
- (2) Deciduous teeth with two third of root is preferred.
- (3) Posterior deciduous teeth are not preferred because of less pulp and chance of infection due to longer retention in the mouth than anterior.
- (4) Extracted teeth are preferred than loose teeth.

#### Adult teeth

- (1) Only vital teeth should be harvested.
- (2) Teeth with infection and any pathology are avoided.

(3) Mobile teeth with lack of blood supply can't be harvested.

(4) Teeth should have sufficient amount of pulp.

### Steps in the dental clinic

- Examine the tooth and rule out any infection.
- Rinse the tooth.
- Transfer to transportation tube.
- Add saline solution.
- Wait for five minutes.
- Seal the tube.
- Transport under room temperature before 48 hrs.

### Steps in the laboratory

- Identification of stem cells with markers.
- Separation of viable cells by centrifuge.
- Cryopreservation.
- Retrieval.

### CONCLUSION

Stem cells can be used to treat various diseases like Parkinson's disease, cancer, spinal injuries, heart diseases, liver diseases, blindness, muscle damage, diabetes and many other diseases in the future. (Fiegel et al., 2006; Lindvall 2003; Goldman and Windrem 2006; Timper et al., 2006).

In the dental field stem cells can correct periodontal problems, injured teeth and jaw bones. The hallmark of stem cells is the regenerative capacity to form entire tooth structure.

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