Dental Stem Cells - A Future Regeneration

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ABSTRACT:

Science is advancing at tremendous pace. Research is going on in various fields to regenerate the damaged cells and organs. It is the ultimate goal of humans to create life. Though this requires a lot of time, we have reached a stage where the required cells are harvested from already existing stem cells. Dental stem cells are such cells which can differentiate to the required cell types. This paper outlines the scope of dental stem cells in healing and regenerating tissues.

Key words: Regeneration, stem cells.

Introduction:

Stem cells are powerful unique cells that can multiply several times and depending on surrounding environment can form specific desired tissue or organ. This has the potential to provide solution for several incurable diseases and injuries. Stem cell research is directed towards perfecting the art of using one’s cells to repair that part of the body which has become affected due to a particular disease. Stem cells can be harvested, made to multiply, stored and utilized whenever required in future. With advanced successes in research, knowledge about stem cells has increased tremendously.

The sources of stem cells increased as did the knowledge about their differential capabilities. Based on origin and capabilities, there are three types of stem cells:

1. Human embryonic stem cells
2. Adult stem cells
3. Induced pluripotent stem cells

Human embryonic stem cells are cells derived from embryos and are grown artificially in laboratory.

With current technology, production of human embryonic stem cells requires destruction of human embryo and hence it becomes a controversial issue.

Adult stem cells are cells which are able to generate into limited types of cells like

A) Hematopoietic stem cells that form blood cells
B) Mesenchymal stem cells that form connective tissues like bone, tendons, muscles, fat and nerves as well as liver and pancreatic cells.
C) Induced pluripotent stem cells are adult cells which have been forced to express the properties of stem cells.

Mesenchymal stem cells are advantageous over other stem cell types for various reasons like
A. No ethical issues.
B. Lesser risk of rejection and less complications during transplantation.
C. Potential to regenerate human tissues.

Role of stem cells

In a normal body,
1. They help in normal development of organs and systems of a body.
2. Normal day to day repair

In a diseased body,
1. They help in repair and/or replacement of body parts after injury.
2. Replacement of specific tissues or organs in particular diseases.

Dental stem cells:

For long, bone marrow and umbilical cord were considered as the only sources for stem cells. However, in recent times, there have been multiple proven sources of stem cells one of them being the tooth.

The dental pulp is the source of dental stem cells. They are stem cells found in deciduous and wisdom teeth.

They contain potent mesenchymal cells which have the ability to differentiate into bone, brain tissue, dental tissue, cartilage and muscle. If dental stem cells are stored in a stem cell bank, and they can be used later.

Sources:

Stem cells can be obtained from baby teeth from 6 to 12 years. Best sources are from canine to canine before the teeth fall out on their own. They can be obtained from wisdom teeth also between 17 and 21 years. Third molars are good source although it is best when the teeth are still developing. The right time to recover baby teeth with stem cells is before they become very loose as the cells in the dental pulp will remain more usable if they continue to have a blood supply.

Advantages of dental stem cells:
1. Ease of harvesting
2. Safe procedure
3. Economical
4. Controversy free

The time period of banking healthy dental stem cells is far better since it can be done for children between 5 to 12 years and adults extracting their wisdom teeth. There is higher chance of finding a perfect match for a child as well as a match for close relatives like siblings, parents, grand parents, uncles/aunts. Collection of cells too is easy, painless, quick, and highly efficient and has no ethical complications. Proven interactivity with biomaterials makes them ideal for tissue reconstruction.

Applications of dental stem cells:
1. Cardiac cells-repair damage caused by myocardial infarction
2. Neuron's-repair damage due to stroke or other degenerative diseases.
3. Myocytes-repair loss due to crush injuries or degenerative diseases
4. Osteocytes-repair fractures, other joint or bone diseases.
5. Adiposities-repair skin loss
6. Chondrocytes-repair of cartilage after injuries or in degenerative diseases like osteoarthritis.
7. Dermal tissue-plastic surgery applications

History of IDPSC’s:

2003 _ Discovery of DPSC’s by Dr. Songtao Shi.
2006 Kerkis reported discovery of Immature dental pulp stem cells, a pluripotent sub population of DPSC using dental pulp organ culture.

2007 1st animal studies begin for bone regeneration.

2007 1st animal studies begin for dental end uses.

2008 1st animal studies begin for heart therapies.

2008 1st animal study for muscular dystrophy therapies.

2008 1st animal studies begin for regenerating brain tissue.

2008 - 1st advanced animal study for bone grafting announced reconstruction of large size cranial bone defects in rats.

2001 1st human trail for cornea replacement.

CONCLUSION:

Stem cells become key players in creation and maintenance of our body. Dental stem cells may in future play a vital role in maintaining and repairing normal and diseased tissues. On such occasion, we, dentists should be efficient to procure the stem cells. Dentists can play a divine role in educating and motivating people towards the miracle cure that can be achieved by stem cell banking.

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