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LIFE SAVING IS COST EFFECTIVE - DENTAL PULP STEM CELLS

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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.However, the knowledge in stem cell technology is increasing quickly in all medical specialties and in dental field too. The applications of stem cells are to cure diseases like juvenile diabetes, Parkinson's, spinal injuries certain forms of cancer and heart problems. Various researches are undergoing to use the stem cells for curing other diseases also. The aim of this paper is to review the economy behind the stem cell banking and to highlight how dental pulp stem cells are cost-effective.

KEYWORDS: **Dental Pulp Stem Cells, Economy, Stem Cell Banking, Cost Effective.**

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INTRODUCTION

Stem cells are recent advances in cellular and molecular biology. The ability of division and differentiation of stem cells play a major role in various researches to treat life threatening diseases. The term stem cell was projected by ALEXANDER MAKSIMOV a Russian histologist, during 1908 in congress of hematologic society at Berlin. During early 1960's the Canadian scientists came out with the good results on stem cells[1]. However since the intent of stem cells is under research, it's very essential to save and defend the stem cells for the future application. By this means, stem cell banks play an important role in identifying by various methods and saving them. But thriftily the charges of stem cell identification and storage are sky rocketing.

STEM CELL- TYPES

Stem cells are biological cells found in all multi cellular organisms that can divide and differentiate into specialized cell types and can self renew to produce more cells. Stem cells are derived from embryonic, foetal and adult tissues. In adults bone marrow, fat, brain tissue, human exfoliated deciduous teeth, dental pulp are the major sources[2]. Stem cells are a hopeful tool for tissue repair[3]. Repairing and regenerating of defective tissues is achievable by stem cells[4]. These mesenchymal stem cells are one of the most potential stem cell which has wide therapeutic application[5].

Stem cell research in abroad

Stem cell research will develop our potential to prevent and treat disease by providing cells for organ transplantation (artificial organs are produced) and cell therapies. Most of the countries in the world have invested more in stem cell research. At the same time some countries have clogged the stem cell research because of the ethical issues involved in embryonic stem cells. Since the embryonic stem cells are derived from the inner cell mass of blastocyst (16 stage embryo). Here derivation of cells from the blastocyst is considered as a misdeed because it deals with destroying a formed embryo and hence scientists did researches on umbilical cord blood stem cells, which can be saved and stored for many years and used in need.

Stem cell banking

Stem cell banks are progressively more seen as a fundamental resource of biological materials for both basic and translational research. Stem cell banks and registries maintain transnational access to quality-controlled and ethically sourced stem cell lines from different origins and of varying grades - for example, research versus clinical. They are furthermore the depositories of 'biological standards'.[6] Global initiatives are emerging to address synchronization and standardization processes for stem cell research and banking; these include the International Society for Stem Cell Research and the International Stem Cell Banking Initiative.[7] Stem cell banks are on the edge to maintain domestic consistency with respect to policy frameworks relating to the acceptability of conducting stem cell research.[7] The term 'stem cell bank' itself can refer to a number of altered levels and types of operations, as well as associations.[8]

Stem Cell Banking In India

Life Cell International, India's first stem cell banking services started in Bangalore (2009). The average amount they charge for collecting and saving the stem cells is around 3000 USD, yearly storage costs are separate. The problem with the stem cell banks is that the charges are not affordable by the normal economic group people.

Dental pulp stem cells

DR. SONGTAO SHI- a Pedodontist discovered dental pulp stem cells in 2003 by using the deciduous teeth of his daughter and he named as stem cells from human exfoliated deciduous teeth. 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 are one of the most potential stem cell which has wide therapeutic application. Dental pulp stem cells can be found both in adults and childrens.[9] Transplantation of Dental pulp stem cells into immunocompromised mice resulted in the formation of a dentine-like tissue, whereas bone marrow stem cells produced a tissue resembling that of lamellar bone[10]. Pulpal wound healing and regeneration may be compromised with growing age. Analyses of pulpal cell populations point out those age-related reductions in pulpal cell numbers occur. Studies have identified a potential progenitor cell population in dental pulp, which comprises less than 1% of the total cells .[11]

Sample selection criteria

Deciduous teeth

(1) Pulp should be vital.
(2) Deciduous teeth with two third of root is preferred.
(3) 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.

Advantages

Dental stem cells are derived from milk teeth since there are 20 viable milk teeth that can be used for collecting stem cell, which can be collected at the time of need, where as umbilical cord blood cells which have to be immediately collected at birth**.** Dental stem cells are non-controversial Adult Stem cells. There are more Viable stem cells and it is very simple to collect without mortality and morbidity. Stem cells of dental origin can generate dental tissues [12, 13,14,15,16]. They are capable of generating a tissue that has morphological and functional characteristics that closely resemble those of human dental pulp [17,18,19,20].

Steps in the dental clinic

• Examine the tooth and rule out any infection. The tooth has to be removed
• 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.

How dental pulp stem cells are cost effective?!

Stem cells are stored in minus degree temperature for future use, this is called cryopreservation. Hematopoietic stem cells and dental pulp stem cells have been cryopreserved and productively utilized for transplantation[21]. But the charges for preserving the stem cells will be at least in billions and the potentiality of stem cells depends on the method of preservation. The biggest benefit of dental pulp stem cells is that they can be obtained from patient's vital pulp since we have 20 deciduous and 32 permanent teeth. This can be done with stem cell markers which assist to identify stem cells. Viable stem cells are more in dental pulp and it is very simple to collect without morbidity and mortality.

CONCLUSION

Although most of the early promises of stem cells have been achieved major challenges are remain. 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.[22, 23, 24, 25] We must use technology, drive and dedication to solve these problems. Since dental pulp stem cells are easy for identification and isolation thus life saving is cost effective. This will require continued

interaction between different disciplines medicine, biotechnology, bio engineering and bio materials etc**.** major support by governments and international agencies, as well as an understanding and supportive public.

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