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Short Communication

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Regeneration and Tissue Engineering Mesenchymal Stem Cells Derived from Adipose Tissue: Perspectives from Stem Cell Biology and Molecular Medicine

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ABOUT THE STUDY

Millions of people worldwide suffer from diseases and the majority can be helped or cured through tissue or organ transplantation. However, defects in tissues and organs are an enormous challenge to medicine [1]. Regenerative medicine has a great pledge of repairing the damage restoring tissue and organs and function by stimulation the body's own reproductive capacity. The Interdisciplinary field includes many technologies and specializations such as Tissue engineering, Medicine and Molecular biology, replacement, engineering or reproduction Cells, tissues, or organs with the goal of restoring or establishing normal function [2].

The Bone marrow-derived stem cells undergo the most invasive aspiration procedure required to be useful for medical use and decrease with both aging and differentiation potential with increasing aging [3]. In search for an alternative stem cell source at the beginning of the 21st century, the multi-potent, undifferentiated, self-renewing progenitor cell population isolated from adipose tissue that is morphologically and phenotypically similar to the Mesenchymal stem cells MSCs. These so-called Adipose Tissue-Derived Stem Cells (ADSCs) [4]. Adipose-Derived Stem Cells (ADSCs) have been discovered for more than a decade. ADSCs are of mesenchymal stem cell origin and can be easily separated from adipose tissue and were first identified in 2001 as MSCs in adipose tissue [5] and since then adipose tissue has been studied as a cell source for tissue engineering and regenerative medicine. Due to the large numbers of cells that can be harvested with relatively little donor morbidity, they are considered to be an attractive alternative to bone marrow derived mesenchymal stem cells.

Adipose tissue is widely distributed throughout the human body and location affects molecular yield. In practice, adipose tissue is usually collected from the abdomen or hip/thigh area. Another important factor influencing ADSC yield is patient age. It has been shown that people of all ages have similar ADSCs [6]. In contrast, ADSCs from infants have higher angiogenic and osteogenic potentials than adults and elderly. Another study supported the idea that expansion activity, colony-differentiation potential and population doubling in ASCs collected from younger patients (>20 years) and older patients (50-70 years) were significantly different. Due to the advancement of technologies, ADSCs can now be obtained in large quantities using minimal invasive techniques. However, in the recent trends ADSCs were using to regeneration and tissue engineering medicine in the damage of human organs.

There are several human organs have been regenerated and repair and the number of clinical applications using ADSCs can be found through searches and on clinical trial websites.

ADSCs have traditionally been cultured in the traditional 2D state, making it inappropriate to mimic cell-cell and cell-environment interactions *in vivo*. Tissue-engineered 3D scaffolding has the amazing ability to simulate closely *in vivo* cellular environments. These 3D scaffolds are designed using bio-fabrication techniques through combining biomaterials, molecular growth factors, and extracellular matrices to provide a 3D microenvironment for cell proliferation and differentiation, which further regulates tissue or organ growth. Recent studies and clinical trials suggest that ASCs in 3D scaffolds could be a viable alternative to wound healing, cardiovascular grafts, orthopedic tissue repair and plastic tissue reconstruction after surgery. The success of the above applications demonstrates the great potential of ADSCs as a cell-based treatment for regenerative medicine.

Despite the positive effects of ADSCs on tissue engineering and regenerative medicine, several researchers have reported that ADSCs exhibited carcinogenic factors. ASC-rich adipose tissue grafts can be used as autologous and allogeneic transplantation for soft tissue reconstruction, followed by mastectomy to reduce cosmetic and psychological problems. However, *in vitro* and animal studies have reported that ADSCs interact with tumour cells and induce tumour progression.

CONCLUSION

From this study, it can be concluded that salbutamol can be formulated as transdermal patches in efficient and convenient manner. Anise and eucalyptol oils had an enhancement role in permeation of salbutamol through skin in concentration not more than 1%. Formulated films in this study had shown many good physicochemical characteristics but formulations F3 and F6 had the most satisfactory characteristics as flexibility, exhibited suitable bio-adhesion strength, and sustained controlled *in vitro* release (less than 70% after 12 hours), therefore they are the best optimum formulations. Accordingly, researches must be preceded for more investigations as stability study and clinical studies in humans to demonstrate the most appropriate dose and the best pharmaceutical formulations to be used. The formulated salbutamol transdermal film is advised to be used after taking an initial dose of a drug due to this films used as maintenance dose only.

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