hospitalization. Many complications are associated with the burn wounds such as infection and scars. Mesenchymal stem cells (MSCs) are a novel therapeutic alternative to accelerate and improve the healing process. Mesenchymal stem cells have properties that favor their use as therapeutic alternative as they stimulate regeneration, promote angiogenesis, and have an immunomodulatory function.

**Aim:** The present study aimed to study the effect of bone marrow derived mesenchymal stem cells in improving the healing of burns.

**Material and methods:** Forty male albino rats weighed 200gm were divided into 4 groups, 5 animals in group I (control) and group II (burn model), 15 animals in group III (untreated) and group IV (MSCs treated). Group III and IV were subdivided into 3 subgroups that were sacrificed after 7, 14 and 21 days respectively. Full thickness burn wounds were induced on a 4 cm² area on the back of rats in groups II, III and IV by subjecting to 90°C hot water for 12 seconds. Mesenchymal stem cells were isolated from the bone marrow of 5 young rats, weighed 100 gm, expanded in vitro, PKH26 labeled and intra-dermally injected in the periphery of burn wounds.

**Results:** Twenty-one days after the thermal injury, the BM-MSC-treated group showed larger proportion of healed area within the burn wounds than the untreated group. There was also significant increase in the epidermal thickness in the BM-MSC-treated group than the untreated one which showed thinning up to loss in the epidermal thickness. In addition, a significant increase in the dermal thickness and collagen area percentage was detected in the BM-MSCs-treated group over the untreated group. Immunohistochemical staining for alpha smooth muscle actin (α-SMA) reaction was done to evaluate the vascularity of the burn wound area. The BM-MSCs-treated group showed significant high density due to neo-angiogenesis caused by cytokines secreted by MSCs. High density immune reaction for α-SMA was found in the untreated group which was attributed to the appearance of myofibroblasts. Electron microscopy examination detected myofibroblasts in the untreated group which denoted scar formation. Mesenchymal stem cells labeled with PKH26 were detected in the regenerated epidermis, dermis and hair follicles of the BM-MSCs treated group.

**Conclusion:** This study demonstrated the therapeutic role of intra-dermal injection of bone marrow derived MSCs in a rat model of full thickness burns, suggesting a future alternative therapy for patients suffering from deep burn injuries.

**The revolutionary muse cell, a puzzle solved**

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Embryonic stem cells and induced pluripotent stem cells have emerged as the gold standard of pluripotent stem cells. They were considered as the class of stem cell with the highest potential for contribution to regenerative and therapeutic applications. However, their translational use was often impeded by teratoma formation, commonly associated with pluripotency. A population of newly discovered nontumorigenic pluripotent stem cells, termed Multilineage-Differentiating Stress-Enduring (Muse) cells, offers an exceptionally innovative and exciting avenue of exploration for the potential treatment of various human diseases. Muse cells could be derived from bone marrow, skin dermis, cultured mesenchymal cells and adipose tissue. They exhibit triploblastic differentiation both spontaneously and under media-specific induction, and do not form teratomas. This review discussed the discovery of Muse cells and described in detail their various unique characteristics. Important on-going investigations on their applications was also highlighted.

**Recent advances in stem cells. From basic biology to clinical applications**

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Basic and clinical research performed during the last few years on different types of stem cells has constituted a revolution in regenerative medicine by providing the possibility of generating multiple therapeutically useful cell types. These new cells could be used for treating numerous genetic and degenerative disorders. Among them, age-related functional defects, hematopoietic and immune system disorders, heart failures, chronic liver injuries, diabetes. In addition, Parkinson’s, Alzheimer’s diseases, arthritis, muscular, skin, lung, eye, digestive disorders, aggressive and recurrent cancers could be successfully treated by stem cell-based therapies. The recent advancements in stem cell biology will be the focus of this review.

**The possible therapeutic role of adipose-derived stem cells on hippocampus of albino rat in a model of Alzheimer’s disease. Histological study**

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Background: Alzheimer’s disease (AD) is a neurodegenerative disorder manifested by a progressive decline in cognitive abilities with no available curative therapy. Adipose-derived stem cells (ADSCs) are a type of mesenchymal stem cells with high proliferation and differentiation capacity. Reports of their neuronal differentiation could indicate a therapeutic potential in AD.

**Aim of the work:** To study the alteration in hippocampal structure in AD experimental model in rat, and to evaluate the potential therapeutic effects of intravenously injected ADSCs in this model.

**Materials & Methods:** Seventy adult albino rats used in the experiment and were divided into four groups: Control group, Alzheimer’s group, ADSCs-treated group and recovery group. Induction of AD was done by oral administration of aluminium chloride, 17mg/kg/day, one cm³, for 75 days. Treatment was done in group III by intravenously injected single dose of ADSCs
suspended in 0.5 ml PBS. The rats of treated and recovery groups were sacrificed after another four weeks. At the end of the experiment, rats were subjected to Morris maze behavioral tests. Then, rat brains were excised and processed for histological examination, morphometrical measurements and statistical analysis.

**Results:** Rats of AD model and recovery groups showed decline in memory functions, alteration in hippocampal structure with degeneration of hippocampal cells and deposition of amyloid plaques and neurofibrillary tangles. Treatment by ADSCs revealed better memory function and evident restoration of histological appearance of hippocampus.

**Conclusion:** The ADSCs had evident therapeutic efficiency in AD rat model. Further studies can be done to ensure clinical efficacy of ADSCs in treatment of Alzheimer’s disease.