editing system holds, it still can be a favourable therapy for type 2 diabetes. Generally, gene therapy carries a high probability of replacing the genes that are causing insulin signalling dysfunction with healthy genes.
Keywords: Type 2 diabetes, CRISPR/Cas9, Gene therapy

Ps-98: The Effects of Lithium on the Activity of Wnt and BMP Signaling Pathways During Oeteogenic Differentiation of Adipose – Derived Mesenchyamal Stem Cells

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Objective: Osteoporosis is one of the most common bone disorders that many people, especially the elderly, suffer from all over the world. Although bone is a tissue that has the ability to repair itself, during osteoporosis, a large part of the bone mass is depleted and causes fractures. There are several treatment options for this injury, including the use of drugs, surgery of the damaged parts, bone grafts, and the use newest approach of tissue engineering and stem cells therapy. Most of the above options have side effects and limitations like enhancement of osteosarcoma, lack of donors, infection and immune reactions, high costs, and failure to repair large lesions. However, the use of stem cells as a renewable source that does not transmit diseases and has anti-inflammatory and modulatory properties is highly recommended. Among the various sources of stem cells, adipose tissue-derived mesenchymal stem cells (AD-MSCs) are a better choice due to their easier access and isolation. During the control of stem cell activities, cellular signaling pathways play important role, among which the Wnt pathway plays a decisive role in bone formation. In the first stage of this study, we determined the role of Wnt signaling pathway in the osteogenic differentiation of AD-MSCs by using lithium chloride as an activator of the Wnt pathway. There is a lot of evidence that Wnt signaling has interactions with other cellular pathways such as BMP, which can affect them and lead to a change in the osteogenic differentiation pathway. Therefore, we investigated the possible interaction of the Wnt pathway with the BMP pathway in the osteogenic differentiation process of mesenchymal stem cells.
Materials and Methods: To determine a non-toxic concentration of lithium suitable for the cells, an MTT assay was performed. A real-time PCR assay was performed due to the activation of the Wnt signaling pathway by lithium. To investigate the effect of LiCl on the osteogenic potential of Ad-MSCs, cells were constantly exposed to 10 mM LiCl, while they were kept in the osteogenic induction medium.The expression of osteogenic-related genes ALP, runt related transcription factor 2 (RUNX2) and OPN(Osteopontin) was measured by real-time PCR. Osteogenesis was then qualified by measurement of the amount of matrix mineralization by Alizarin Red staining and calcium cintent assay.
Results: Results indicated that the adipose-derived mesenchymal stem cells in 10 mM lithium concentration maintained healthy growth however the effect of lithium on the cells, compared to the control group, resulted in a decreased activation of the Wnt signaling pathway as well as reduced osteogenic differentiation.
Conclusion: Lithium chloride causes differentiation inhibition.
Keywords: Lithium chloride, Osteogenesis, Mesenchymal stem cells, Wnt pathway

Ps-99: Comparing the Impact of 3D and 2D Culture System on Immunomodulation Potency of Bone Marrow Derived-Clonal MSCs

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Objective: Mesenchymal stem cells (MSCs) hold great therapeutic promise due to their regenerative and immunomodulatory abilities. However, scaling up production while maintaining quality is challenging with traditional 2D cultures. Bioreactors offer precise control over growth conditions, enabling reliable, large-scale manufacturing of high-quality MSCs. Current efforts focus on standardizing protocols and optimizing cost-effective methods to transition MSC therapies from the lab to widespread clinical use.
Materials and Methods: MSCs were expanded in a DASbox bioreactor under normoxia (100% DO) and hypoxia (20% DO), then co-cultured with activated PBMCs (1:2 and 1:10 ratios) for LPA to assess immunosuppression. For in vivo testing, they were intravenously injected into inflamed BALB/c mice (control, sham, treatment groups). Blood and tissues (liver, kidney, lung) were analyzed.
Results: Hypoxic MSC expansion in the DASbox bioreactor yielded 9×10^7 cells in 12 days with enhanced immunomodulation. Improved microcarrier adhesion under hypoxia (with optimized agitation) significantly boosted proliferation while reducing medium consumption by 2.5× versus 2D cultures, lowering industrial-scale costs. CFSE-based flow cytometry showed hypoxic MSCs suppressed PBMC proliferation as effectively as negative controls. In septic mice, hypoxic MSC treatment normalized acute inflammation (reduced neutrophils), lowered elevated urea/creatinine, and restored TNF-α/IL-2/IFN-γ to near-control levels.
Conclusion: Large-scale bioreactor systems are crucial for scalable, reproducible, and regulatory-compliant production of MSCs. Advanced PAT-enabled platforms enable real-time monitoring of critical quality attributes, ensuring consistency and clinical-grade standards.
Keywords: Mesenchymal stromal cell, Bioreactors, Hypoxia, Dynamic culture

Ps-100: Biocompatibility Assessment of Electrospun PVA–Origanum Vulgare Fibers Using HDF Cells

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Objective: Tissue engineering aims to repair and restore the function of damaged tissues using cells, scaffolds, and bioactive molecules. Biopolymeric materials are of significant interest in scaffold fabrication due to their inherent biocompatibility and therapeutic properties. Among various fiber production

techniques, electrospinning uniquely enables the fabrication of scaffolds with structures closely resembling the extracellular matrix (ECM), producing fibers ranging from the nano- to microscale. In this study, biocompatible fibers composed of polyvinyl alcohol (PVA) and Origanum vulgare extract were fabricated via electrospinning and evaluated for biomedical applications. Water-soluble PVA was used as the scaffold base, while Origanum vulgare extract—rich in anti-inflammatory and antioxidant bioactive compounds—was incorporated to enhance both structural support and tissue healing.
Materials and Methods: A 10 wt% PVA solution was prepared by heating to 80°C and then cooled to room temperature. Origanum vulgare extract was obtained through hydroalcoholic extraction and rotary evaporation, and added to the polymer solution at a defined weight ratio. Electrospinning was performed under standardized conditions: 20 kV applied voltage, ambient temperature of 23°C, and relative humidity of 47%. Fiber morphology was analyzed using SEM, while FTIR was used to evaluate interactions between functional groups. Cytotoxicity was assessed via MTT assay using human HDF cells seeded at a density of 5000 cells per well in 96-well plates, with exposure durations of 24 and 48 hours.
Results: SEM imaging revealed uniform, bead-free fibers with average diameters of 27, 30, and 36 µm. FTIR spectra displayed sharp peaks in the wavenumber ranges of approximately 2900 and 3286 cm^{-1}, indicating interactions between hydroxyl groups in PVA and phenolic compounds in Origanum vulgare. MTT assay results showed no cytotoxic effects on HDF cells at either time point.
Conclusion: Electrospun PVA scaffolds incorporating Origanum vulgare extract exhibited high biocompatibility and porosity. In addition to offering protection against oxidative stress and inflammation, the scaffolds also promoted the proliferation of skin fibroblasts. These findings suggest potential for future applications in wound healing and tissue regeneration studies.
Keywords: Electrospinning, Origanum vulgare, HDF cell line, Polyvinyl alcohol

Ps-101: PPIG and EPRS Hub Genes Identified as Targets to Parkinson's Disease Via Bioinformatics Approaches

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Objective: Parkinson's disease (PD) is a progressive neurological disorder that primarily negatively affects movement control, caused by the reduction of dopaminergic neurons in the brain. Despite extensive research, the molecular mechanisms underlying this disease remain unanswered.
Materials and Methods: This study aims to report a comprehensive analysis of differentially expressed genes (DEGs) in Parkinson's patients compared to healthy individuals. We utilized the Gene Expression Omnibus (GEO) database with access number GSE150696, where we identified 1455 differentially expressed genes, including 674 upregulated genes and 781 downregulated genes. Using protein-protein interaction (PPI) analysis with the STRING database and the Cytoscape program, we identified the top twenty hub genes involved in Parkinson's pathology.
Results: In further investigations, we identified two novel hub genes, PPIG and EPRS, which had not been previously studied in Parkinson's research and could potentially be recognized as new therapeutic targets.
Conclusion: These findings enhance our understanding of the molecular aspects of Parkinson's disease and provide a new era for implementing targeted therapies. By advancing therapeutic strategies, genetic analysis, and the exploration of new biomarkers, future studies could contribute to more advanced treatment strategies.
Keywords: Parkinson's Disease, Gene Expression, Microarrays, Bioinformatics, Hub genes

Ps-102: Sustained And Localized Delivery of Retinal Pigment Epithelial Cells-Derived Factors by Peg-Based Bioadhesive for Regenerative Repair of Retinal Detachment

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Objective: Retinal detachment is a severe eye condition that can result in irreversible vision loss due to the degeneration of photoreceptors. Standard treatments often fail in extensive cases or with macular holes. There is an urgent need for novel approaches that provide both tissue adhesion and cellular protection to improve surgical outcomes. This study evaluates a polyethylene glycol (PEG)-based adhesive hydrogel loaded with growth factors secreted by retinal pigment epithelium (RPE) cells as a regenerative tissue adhesive.
Materials and Methods: Hydrogel formulations were prepared using various molar ratios of amine (NH2) and succinimidyl ester (NHS) derivatives of 4arm-PEG (1:1, 1:1.5, 1:2, and 1:3). Adhesion strength was measured via lap shear test, while mechanical compatibility was assessed through compression testing to determine the elastic modulus. The hydrogel biodegradability in BSS was monitored over 26 days and protein release profile was determined by BCA kit. Cytocompatibility was evaluated by MTS assay in a normal retinal ganglion cell line. To model disease conditions, the retinal ganglion cell line was subjected to oxidative stress induced by tert-butyl hydroperoxide (TBHP). The bioactivity of incorporated growth factors was assessed by their ability to mitigate cell death under the inflammatory conditions.
Results: The PEG hydrogel with a 1:2 molar ratio of NH_2/NHS exhibited superior adhesive strength (145±3.034 kPa), proper biodegradation rate (over 7 days), and a tissue mimetic elastic modulus of 10.1±1.109 kPa. Cytotoxicity assays confirmed biocompatibility, while growth factor-loaded hydrogels significantly reduced cell death in oxidative stress modeled cells, demonstrating neuroprotective effects.
Conclusion: The PEG-based hydrogel loaded with RPE-derived growth factors showed promise as a regenerative retinal tissue adhesive, providing mechanical stability, biodegradability, and neuroprotection. These findings suggested its potential application in complex retinal detachment cases, including