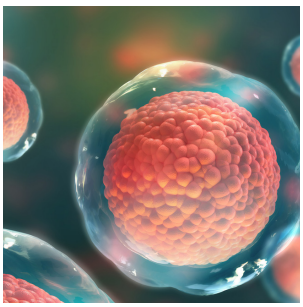
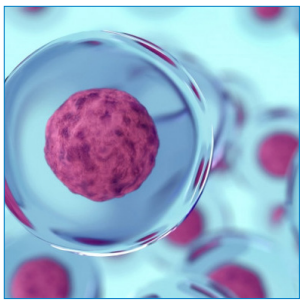
Accepted Abstracts

Stem Cell 2022




6th World Congress and Expo on

Cell and Stem Cell Research

March 16, 2022 | Webinar

Intestinal stem cell differentiation after massive small bowel resection is regulated by Notch signaling in a rat model

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Objective: Notch signaling promotes differentiation to the absorptive cell lineage rather than to the secretory cell lineage. The objective of this study was to determine the role of Notch signaling in intestinal stem cell differentiation in a rat model of short bowel syndrome (SBS).

Methods: Male Sprague-Dawley rats were randomly assigned to one of two experimental groups of 8 rats each: Sham rats underwent bowel transection and re-anastomosis, SBS- rats underwent 75% mall bowel resection. Rats were sacrificed on day 14. Illumina's Digital Gene Expression (DGE) analysis as used to determine Notch signaling gene expression profiling. Notch-related gene and protein expression were determined using Real Time PCR, Western blotting and immunohistochemistry.

Results: From 7 investigated Notch-related (by DGE analysis) genes 6 genes were up-regulated in SBS vs control animals with a relative change in gene expression level of 20% or more. A significant up-regulation of Notch signaling related genes in resected animals was accompanied by a significant increase in Notch-1 protein levels (Western Blot) and a significant increase in NOTCH-1 and Hes -1 (target gene) positive cells (immunohistochemistry) compared to sham animals. Evaluation of cell differentiation has shown a strong increase in total number of absorptive cells (unchanged secretory cells) compared to control rats.

Conclusions: Two weeks after bowel resection in rats, stimulated Notch signaling directs crypt cells population toward absorptive progenitors.

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Homogeneous distribution of hMSC in 3D PCL scaffold by electrical stimulation

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Tissue engineering has shown tremendous promise in creating biological alternatives for harvested tissues, implants, and prostheses. An ideal scaffold for tissue regeneration should possess large porosity and pore size for good infiltration of cells, high pore interconnectivity for tissue ingrowth. Cell culture in 3-D porous scaffolds is often impaired by the difficulty of achieving a homogeneous cell seeding and by the diffusion constraints within the cell-scaffold constructs. In the present study, we investigated the effect of electric stimulation on the migration of hMSCs and infiltration of hMSCs into 3D PCL scaffold by electric stimulation.

To fabricate the porous scaffold, we simulated the current distribution in designed scaffold using comsol physics computer program. We designed lattice structure for difficult infiltration without any stimulation. Then, 3D PCL scaffolds was fabricated by 3D printing. During electrotaxis on 2D, hMSCs moved toward the anode or cathode under direct current electric fields. Cell seeded into PCL scaffold, incubated for 1day, and then treated 1000 μA electric for 3h using a customized agar-salt electrotaxis chamber. After electric current treatments, cell distribution on PCL scaffold were visualized by immunofluorescence staining. As a result, if there was no electric treatment, cell stayed near the surface of scaffold. However, electric stimulation enhanced the infiltration of cells into scaffold and hMSC distributed and proliferated on 3D scaffolds for 28 d, homogenously. In conclusion, the infiltration of hMSCs into scaffold was enhanced by the control of migration using physical stimulations as electrical stimulation.

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