

Submission No.: CS12-5376

Session : Concurrent Symposium 12 (Basic)

Date & Time, Place : November 19 (Sat), 15:30-17:00, Room 6F-1

Session Title : Tissue/Bio-engineering

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## Recent progress in organoid based regenerative medicine

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Cell-based therapy approaches, including the application of [hematopoietic stem cells](#) (HSCs) and [mesenchymal stem cells](#) (MSCs), have been reported to be effective in treating degenerative diseases. Although these treatments were found to relieve symptoms through anti-inflammatory effects, they have not been shown to have direct regenerative effects. By contrast, the organoid-based regeneration approach may potentially induce direct regeneration of damaged tissues and hence, could provide a new treatment alternative to anti-inflammatory drugs in patient's refractory to these agents. In our study, mouse colon organoids were transplanted successfully into a mouse model of radiation proctitis, with these mice having a genetic background identical to that of the donor mice. These results indicate that [autologous transplantation](#) may be possible in humans, in that [mucosa](#) collected from an intact site in a patient by endoscopic mucosal resection can be cultured as organoids, with the latter transplanted into lesion sites. The clinical application of organoid therapy requires the development of a culture method that has been proven safe, as well as a reproducible manufacturing process and quality control indicators for the production of clinical grade pharmaceuticals. Matrigel is an injectable matrix for colon organoid transplantation that originates from Engelbreth-Holm-Swarm (EHS) mouse sarcoma cells. Because of its undefined composition and tumorigenic potential in vivo, Matrigel cannot be used as a culture material in clinical applications. We previously developed culture methods using collagen, which can replace Matrigel as an extracellular matrix for 3-dimensional culture, as well as RS-246204, a chemical compound that can replace R-spondin-1 in organoid growth medium. These culture methods and materials raise the possibility of developing clinical grade organoids for [regenerative therapy](#). In summary, our study showed that colon organoid-based regeneration therapy could be a highly promising therapeutic option for the treatment of patients with radiation proctitis. Furthermore, adult tissue derived organoid-based approaches may be applicable for the treatment of other gastrointestinal diseases, such as ulcerative colitis, Crohn's disease, Behcet's disease, and even upper gastrointestinal disorders including radiation esophagitis, refractory gastric ulcers, and short bowel syndrome.