

Tissue Engineering Functional Gastrointestinal Regions: The Importance of Stem and Progenitor Cells.

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Public Summary:

The intestine shows extraordinary regenerative potential that might be harnessed to alleviate numerous morbid and lethal human diseases. The intestinal stem cells regenerate the epithelium every 5 days throughout an individual's lifetime. Understanding stem-cell signaling affords power to influence the niche environment for growing intestine. The manifold approaches to tissue engineering may be organized by variations of three basic components required for the transplantation and growth of stem/progenitor cells: (1) cell delivery materials or scaffolds; (2) donor cells including adult stem cells, induced pluripotent stem cells, and in vitro expansion of isolated or cocultured epithelial, smooth muscle, myofibroblasts, or nerve cells; and (3) environmental modulators or biopharmaceuticals. Tissue engineering has been applied to the regeneration of every major region of the gastrointestinal tract from esophagus to colon, with scientists around the world aiming to carry these techniques into human therapy.

Scientific Abstract:

The intestine shows extraordinary regenerative potential that might be harnessed to alleviate numerous morbid and lethal human diseases. The intestinal stem cells regenerate the epithelium every 5 days throughout an individual's lifetime. Understanding stem-cell signaling affords power to influence the niche environment for growing intestine. The manifold approaches to tissue engineering may be organized by variations of three basic components required for the transplantation and growth of stem/progenitor cells: (1) cell delivery materials or scaffolds; (2) donor cells including adult stem cells, induced pluripotent stem cells, and in vitro expansion of isolated or cocultured epithelial, smooth muscle, myofibroblasts, or nerve cells; and (3) environmental modulators or biopharmaceuticals. Tissue engineering has been applied to the regeneration of every major region of the gastrointestinal tract from esophagus to colon, with scientists around the world aiming to carry these techniques into human therapy.

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