

Cell-Free Biomaterial for Tissue Regeneration and Repair

A method for using differentiating embryonic stem cells to efficiently derive acellularized biomaterial with potent regenerative abilities for use in tissue engineering and wound healing

Georgia Tech inventors have developed acellularized tissues from clusters of ES cells that include growth and differentiation factors sufficient to promote wound healing in adjacent tissue. The materials retain native structural and biochemical elements but are devoid of cell nuclei and cytoskeleton, replicating the unique signals of early embryonic patterning. As a result, the biomaterial could facilitate regeneration of tissues and organs—be they defective, diseased, damaged, or ischemic—and direct tissue morphogenesis in vivo. Because it is based on embryoid bodies, this technique offers the regenerative potential provided by signals derived directly from ES cells during the course of induced cellular differentiation.

Summary Bullets

- **Simple** — does not require difficult or extensive preparation
- **Regenerative** — provides unique molecular cues similar to early embryogenesis, enabling directing of cell differentiation and tissue morphogenesis
- **Compatible and customizable** — can be tailored for specific tissue applications by directing the differentiation of the ES cells prior to acellularization

Solution Advantages

- **Simple** — does not require difficult or extensive preparation
- **Regenerative** — provides unique molecular cues similar to early embryogenesis, enabling directing of cell differentiation and tissue morphogenesis
- **Compatible and customizable** — can be tailored for specific tissue applications by directing the differentiation of the ES cells prior to acellularization
- **Flexible** — may be modified for use in diagnostic, therapeutic, and prophylactic applications

Potential Commercial Applications

- Tissue engineering
 - Regenerative/repair therapies for the heart, arteries, nerves, bladder, small intestine submucosa, etc.
- Wound healing

- Cell transplantation therapy
 - Delivery vehicle for stem/somatic cells for therapies to treat cancer

Background and More Information

Due to their ability to differentiate all cell types found in the body, ES cells are ideal for a variety of cell transplantation therapies and tissue repair. Acellularization is the process of removing cells from a tissue without disrupting the native structure and extracellular matrix. The resulting materials are less likely to elicit an immune response than traditional stem cell therapies. These acellular matrices derived from embryoid bodies—and therefore harboring embryonic morphogenic cues—may yield a unique class of regenerative biomaterials capable of restoring endogenous cellularity and mediating scarless wound repair.

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Publications

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Images

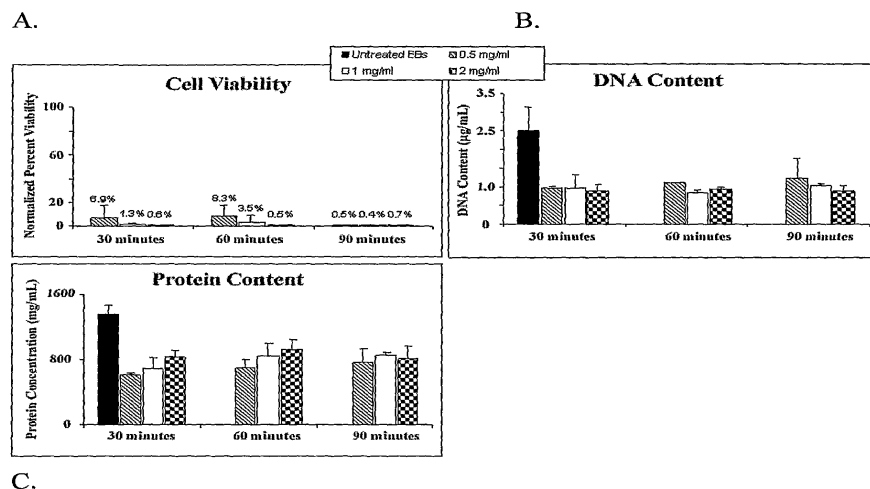


Figure 4

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