ABSTRACT

Objective: Develop a functional, implantable salivary gland to restore salivary functions in patients with post-radiation xerostomia.

Study Design: Reconstruction of functional salivary glands builds on generation of cell-laden mini-modules (MMs) that reassemble glandular anatomy units when encased within a hydrogel cage and implanted subcutaneously in vivo. A stable, biocompatible and biodegradable hydrogel capsule for use in vivo is needed to support formation of salivary spheroids and complex cell-assemblies that can be implanted in vivo and assist development of a tissue-engineered salivary gland.

RESULTS

I. Generating cell-laden mini-modules (MMs): A 3D HA hydrogel culture system that leads to assembly of salivary gland cells into organized spheroid structures

II. Generating the cell-MM capsule: A mechanically-strong 3D hydrogel system capable of encasing and supporting the soft cell-MMs over time in vivo

III. Rodent parotid gland surgical resection model for evaluating engineered hydrogels

CONCLUSIONS

- Delivery of gland cells from spheroid structures in soft 3D HA hydrogels (HA-SH/PEGDA) with an elastic modulus of ~260 Pa.
- To surgically simulate acinar cell loss, a porous gel-based resection model was developed.
- A ~260 Pa hydrogel capsule (HA-SH/HA-AC) was maintained for over 8 weeks in vivo.
- Implants developed vasculature in the periphery and on top of the hydrogels.

FUTURE WORK

- Encapsulate cell-MMs in capsule hydrogels to ensure survival and retention of salivary cells in vivo.
- Introduce VEGF-PDGF in hydrogels for longer term in vivo studies.
- Analyze infiltration of blood vessels into hydrogels and determine the time needed for blood vessels to infiltrate through each of the hydrogels.
- Ensure formation of稳健 vasculature.

REFERENCES


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