Human salivary gland stem cell-derived extracellular matrix enhances formation and maturation of salivary gland organoids

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Abstracts

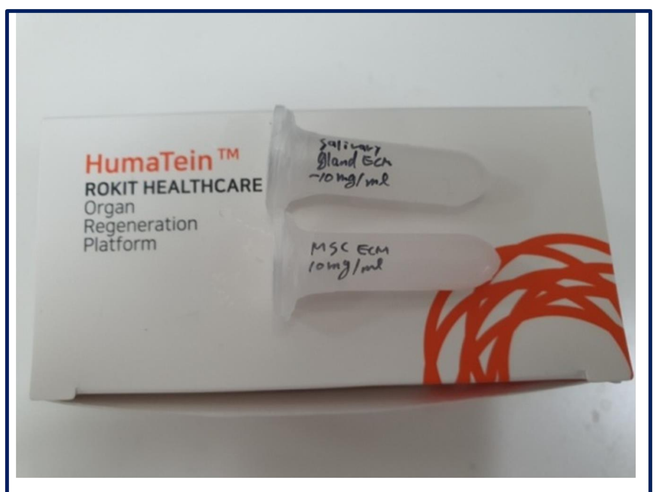
Purpose: The purpose of this study was to culture human salivary gland organoids using salivary gland stem cell(SGSC)-derived extracellular matrix (ECM) instead of the basement membrane-derived ECM (Matrigel) to obtain transplantable organoids from human resources.

Methods: Decelluarized ECM was prepared from primary human SGSCs of parotid glands. Human salivary cells (sublingual or parotid, hSLG or hPG) were then embedded into Matrigel, human adipose mesenchymal stem cell (MSC)- derived ECM, or human SGSC-derived ECM. The number, size, and growth of organoids were measured and compared among three groups. The cell types in generated organoids were identified by immunofluorescent staining. The secretory salivary function was determined by measuring amylase activity. Results: Salivary gland organoids were generated in all the ECM cultures and growth rate of organoids was similar in three conditions. However, the expression location of ductal cell markers, K5 and K7 at the basal and luminal position, respectively was not identical. Although AQP5, a pro-acinar marker, was identified in three ECM cultures, myoepithelial marker was only present in the in SGSC-derived ECM culture group with bi-layer surrounding acini. In, hPG derived organoid showed that the activity of Amy1 per unit cell was significantly higher in MSC-derived ECM than those of SGSC-derived ECM or Matrigel. Interestingly, hPG organoid cannot well-established in SGSC derived ECM.

Conclusion: Salivary gland organoid using SGSC-derived ECM successfully generated salivary gland organoids to recapitulate the specific characteristics of human salivary glands. We propose that salivary gland organoid culture in SGSC-derived ECM may offer opportunities to broaden insights on tissue-mimicking salivary gland organoids.

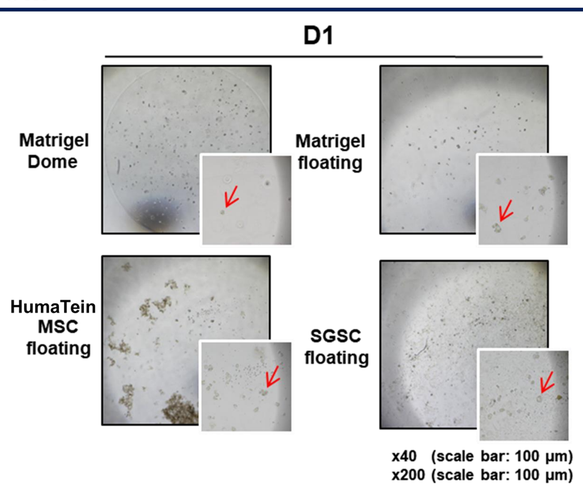
Results

Extraction MSC-, SGSC- derived ECM



Each ECM was prepared at a concentration of 10 mg/ml.

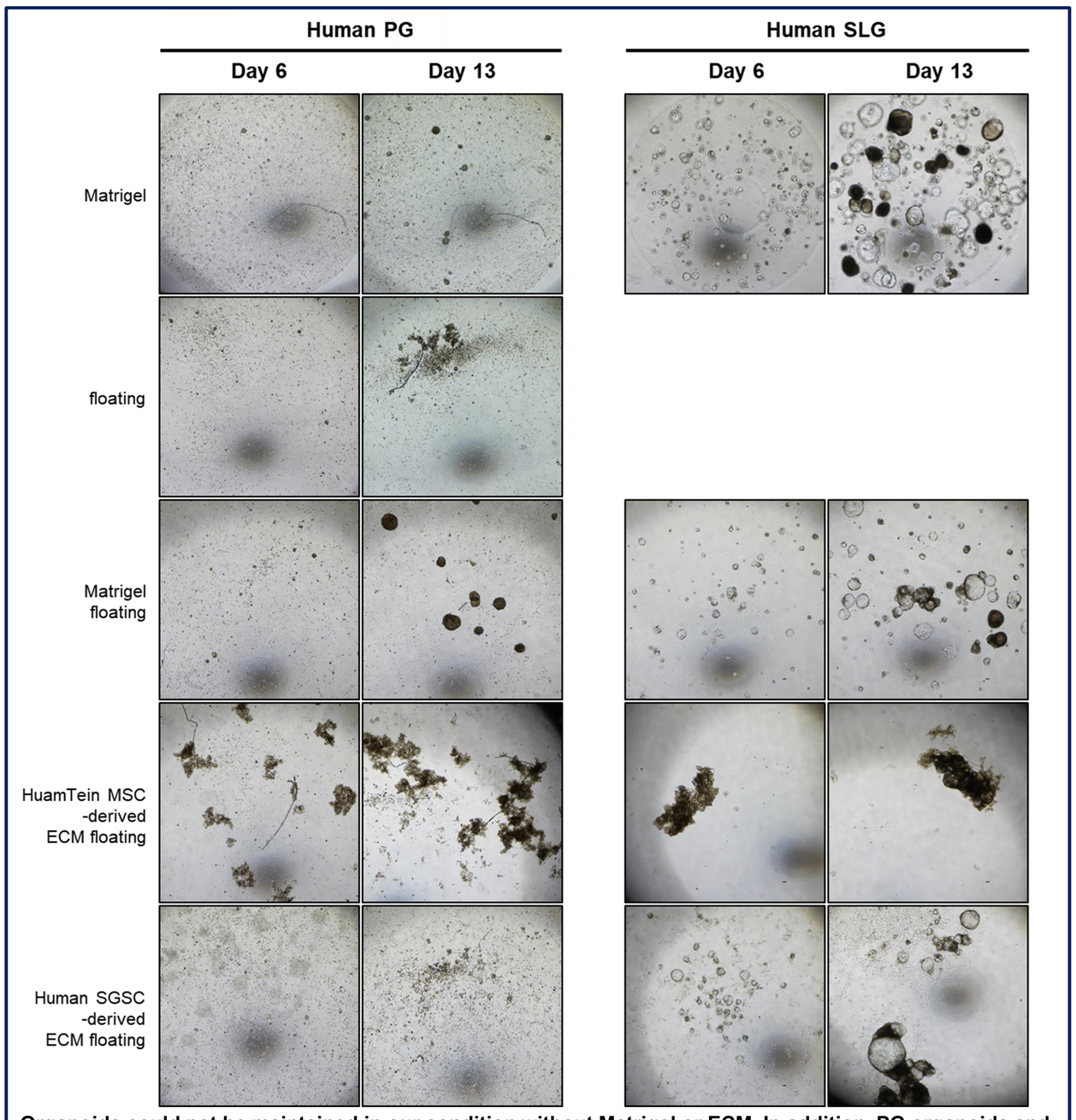
Same number of human SLG cells seeded in ECM



Specimen information
Fresh primary SLG cell isolation (Sex: Male, Age: 20)
2,500 cells/well
Floating condition: 0.5 mg/mL

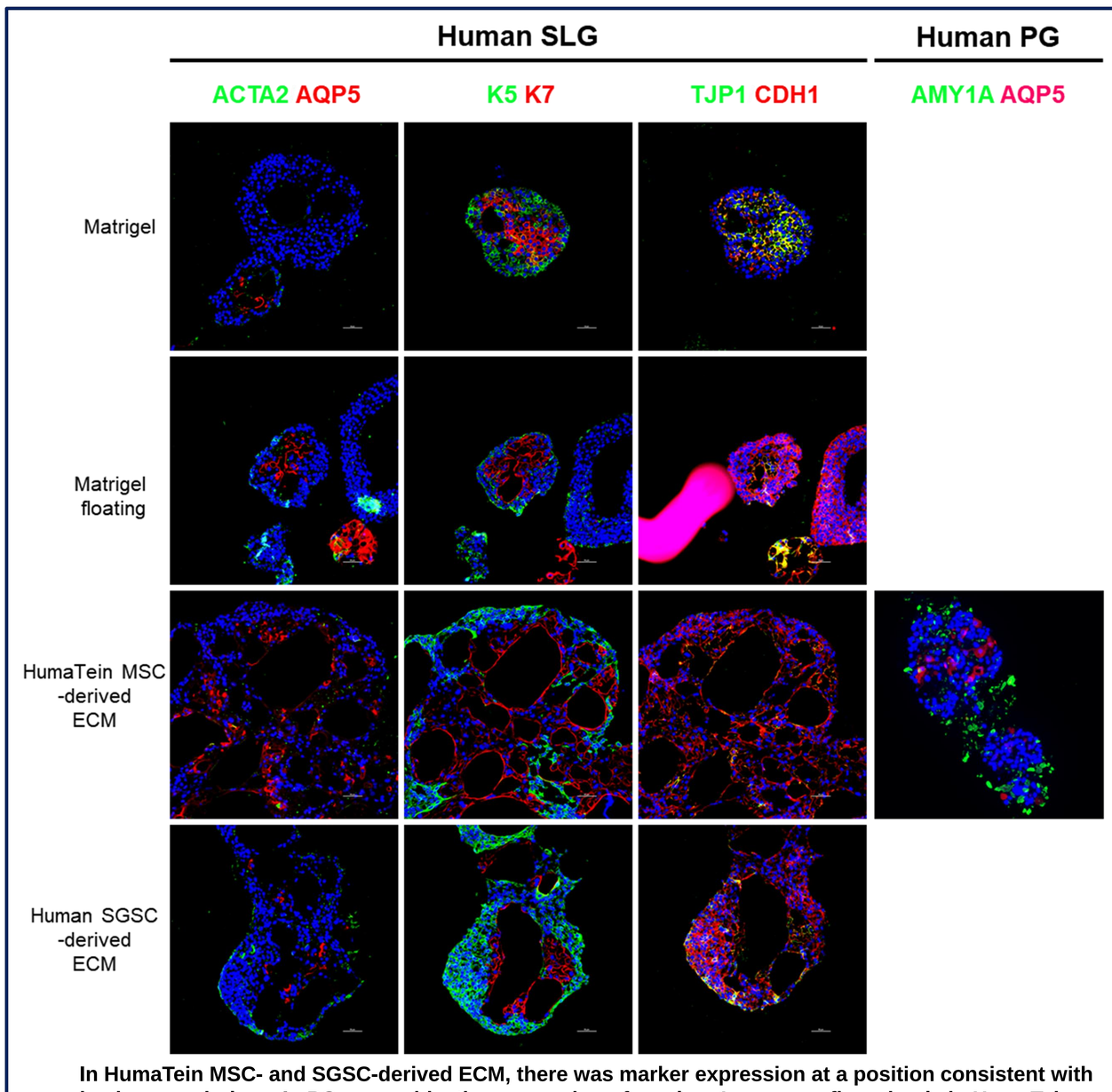
Results

Growth morphology of PG, SLG organoids according to ECM



Organoids could not be maintained in our condition without Matrigel or ECM. In addition, PG organoids and SLG organoids grew in different forms.

Marker expression position in organoids varies according to ECM



In HumaTein MSC- and SGSC-derived ECM, there was marker expression at a position consistent with in vivo morphology. In PG organoids, the expression of amylase1a was confirmed only in HumaTein MSC.