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PRESENTER (COUNTRY ONLY): Belgium
CONTROL ID: 3597822
FINAL ID: 0078
TITLE: Dental Organoids – a New Approach Towards Human Tooth Regeneration?
ABSTRACT BODY:
Objectives: Tooth loss, mostly as a consequence of oral disease, is a major health problem worldwide. Replacing missing teeth with a biological tooth would be an interesting alternative to the current standard implantation of synthetic materials. Organoids, defined as self-forming 3D in vitro reconstructions of a tissue, provide a powerful means to pursue this goal.
Methods: In our lab, we succeeded in developing an organoid model derived from adult human dental tissue acquired following tooth extraction.
Results: These dental organoids express stem cell (e.g. SOX2) as well as tooth-related markers (e.g. amelogenin) and are long-term expandable. Interestingly, they show differentiation potential towards ameloblast-like cells when cultured in specified medium. Concordantly, single-cell RNA-sequencing reveals key features of amelogenesis and convergences with recently identified markers of mouse incisor mature ameloblasts. Finally, the organoids are able to deposit mineralized tissue when transplanted in vivo.
Conclusions: Taken together, we developed a new, unique organoid model which will provide a powerful tool to study human tooth development, pathology and repair, and may pave the way towards tooth regenerative replacement therapy.
PRESENTER: Lara Hemeryck
PRESENTER (INSTITUTION ONLY): KULeuven
AUTHORS (FIRST NAME INITIAL, LAST NAME): L. Hemeryck[1], F. Hermans[2, 1], I. Lambrichts[2], A. Bronckaers[2], H. Vankelecom[1]
AUTHORS/INSTITUTIONS: L. Hemeryck, F. Hermans, H. Vankelecom, Department of Development and Regeneration, KULeuven, Leuven, Vlaams Brabant, BELGIUM|F. Hermans, I. Lambrichts, A. Bronckaers, Department of Morphology; Biomedical Research Institute, UHasselt, Diepenbeek, BELGIUM|

PRESENTER (COUNTRY ONLY): Belgium

CONTROL ID: 3598801

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TITLE: Mouse Molar and Incisor Organoids: Innovative Tools for Regenerative Medicine

ABSTRACT BODY:

Objectives: Worldwide, tooth loss, typically a consequence of oral or congenital disease or traumatic injury, is an important health problem, commonly treated by implantation of synthetic materials. Despite recent research efforts using different stem cells and biomaterials, complete regeneration of dental tissues is not yet possible. Being able to induce tooth regeneration with biological material, preferentially of biological origin, would resolve most of the limitations of current treatments based on synthetic components. Organoids, self-organizing stem cell-derived three-dimensional in vitroreconstructions of an organ, provide a powerful strategy to meet this objective.

Methods: Here, we embarked on the establishment of mouse tooth organoids as a tool to explore tooth biology and regeneration.

Results: We were able to establish organoids from early-postnatal mouse molars and incisors. The organoids were found long-term expandable, at present for more than 10 passages. Gene expression and immunostaining analyses revealed the presence of multiple dental markers, including amelogenin (AMELX). In addition, known dental epithelial stem cell markers (such as SOX2) were detected in the tooth organoids suggesting a prominent stemness character. Currently, we are testing the differentiation capacity of the molar- and incisor-derived organoids using in vitro and in vivo approaches. In fact, we have already obtained an improved in vitro protocol resulting in drastic increases in AMELX and ODAM, both at the gene and protein level.

Conclusions: Eventually, our study will help to unravel molecular and cellular aspects of tooth development, as well as of dental stem cell biology, in the end instrumental for pursuing tooth regenerative replacement therapy.

PRESENTER: Florian Hermans

PRESENTER (INSTITUTION ONLY): Hasselt University, KU Leuven

AUTHORS (FIRST NAME INITIAL, LAST NAME): F. Hermans[1, 2], L. Hemeryck[2], I. Lambrichts[1], H. Vankelecom[2], A. Bronckaers[1]

AUTHORS/INSTITUTIONS: F. Hermans, I. Lambrichts, A. Bronckaers, Department of Morphology, Hasselt University, Hasselt, BELGIUM|F. Hermans, L. Hemeryck, H. Vankelecom, Department of Development and Regeneration, KU Leuven, Leuven, BELGIUM|