

GENERATION OF LUNG AND THYROID ORGANIDS FROM HUMAN EMBRYONIC STEM CELLS

POTENTIAL APPLICATIONS

- Thyroid Regenerative medicine
- Tissue-Engineering
- Progenitor and Stem Cell Therapies
- Drug screening
- Toxicity studies

Collaboration type
License agreement
R&D collaboration

IP status
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THE TECHNOLOGY IN A NUTSHELL

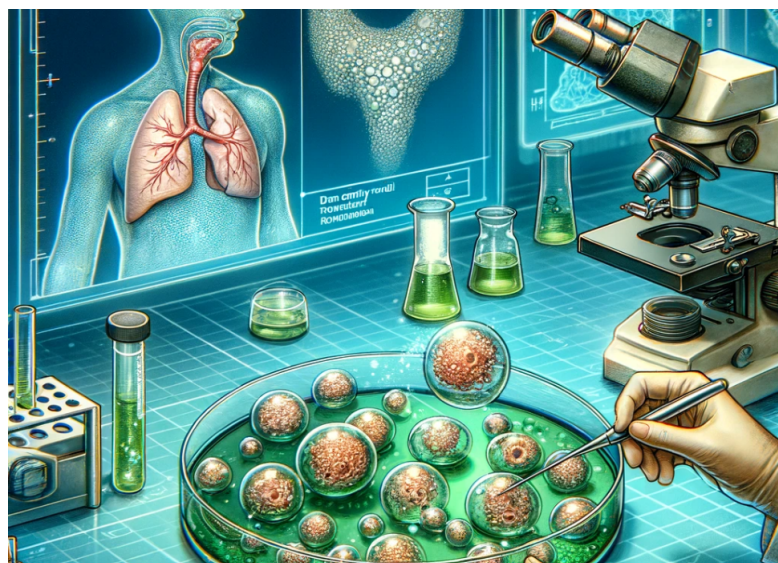
New process for creating thyroid and lung tissues from stem cells, achieving all cell types from both organs with high efficiency, while cells autonomously organize into organoids.

STATE OF THE ART

Inside the endoderm of the digestive tract, cell progenitors expressing the NKX2.1 gene give rise to thyroid follicular cells and all cell types of the pulmonary epithelium. The molecular networks that control the cell fate of these Nkx2.1+ progenitors remain largely unknown.

THE INVENTION

Using a hESC line, we have generated a protocol where by using insulin we can switch differentiation of human embryonic stem cells from thyroid fate towards lung fate. In this protocol we used a human embryonic stem cell line genetically modified to overexpress two main thyroid transcription factors, NKX2.1 and Pax8 when treated with doxycycline.



KEY ADVANTAGES OF THE TECHNOLOGY

- For thyroid model, the technology efficiently produces the single cell type of the thyroid, organizing them into follicles akin to the native organ.
- Modifiable culture conditions for lung model, enabling the promotion of specific cell types, such as alveolar cells, crucial for gas exchange.
- The technology enables the efficient production of all cell types from both organs, with resulting cell populations self-organizing structurally into organoids.

TECHNOLOGY READINESS LEVEL

TRL-3 Proof of concept of the technology on a preclinical model.



THE TEAM

IRIBHM is part of the **Medical School of the *Université Libre de Bruxelles (ULB)*** and one of the largest research structures of the university. Founded in the 1960s with the aim of applying an interdisciplinary approach to the study of thyroid pathophysiology, the Institute has thrived over the years into a number of independent groups with diversifying research interests. Presently, about 130 researchers and technicians are working in the Institute over a range of subjects encompassing signal transduction, development, neuroscience and cancer, using cell and molecular biology approaches. Staff researchers include physicians, physicists, bioinformaticians, (bio)chemists and biologists.

The activities of IRIBHM are mainly taking place on the Erasme campus of ULB, in the suburbs of Brussels, although the Institute also contributes to the *Institut de Biologie Moléculaire et Médicale (IBMM)* on the Gosselies campus. The heavy equipment is common to the whole Institute and often shared with other groups of the campus as technological platforms. This includes genomics, proteomics, transgenesis, FACS and confocal microscopy facilities.

RELEVANT PUBLICATIONS

> *Transplantable human thyroid organoids generated from embryonic stem cells to rescue hypothyroidism*

Mírian Romitti, Adrien Tourneur, Barbara de Faria da Fonseca, Gilles Doumont, Pierre Gillotay, Xiao-Hui Liao, Sema Elif Eski, Gaetan Van Simaey, Laura Chomette, Helene Lasolle, Olivier Monestier, Dominika Figini Kasprzyk, Vincent Detours, Sumeet Pal Singh, Serge Goldman, Samuel Refetoff, Sabine Costagliola

