Differentiation of Kidney progenitors using Induced Pluripotent Stem Cells and Conditioned Media of Renal Cortical Tubular Epithelial Cells

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Central Research Question

Can we take a patient's own skin cells and derive iPS cells that produce the needed cell types on a prepared protein scaffold to form a functioning kidney?

Project Purpose

We intend to determine if Induced Pluripotent Stem cells (iPSCs) can be differentiated into kidney progenitors by conditioned media of Renal Cortical Tubular Epithelial Cells (RCTEs). Our purpose is to identify the expression of kidney progenitors such as Intermediate Mesoderm (IM), Ureteric Epithelium (UM), and Metanephric Mesenchyme (MM) with the use of immunofluorescence methods. These are several different types of cells that could be used to grow kidney tissue. This project is important because the ability to create an artificially grown kidney could reduce the risk of transplant rejection and be prepared with little waiting time. This could reduce the amount of deaths from kidney disease dramatically.

Project Methodology

RCTE cells will be cultured in a solution including DMEM, Fetal Bovine Serum, Amphotericin b, Penicillin and Streptomycin. Conditioned growth media will be collected and saved. IPSCs will be cultured in a solution of Essential 8 media on Vitronectin-coated chamber slides.

Trials will be performed including 9, 6, and 3-day exposure periods to 75%, 50%, and 25% RCTE conditioned media. A negative control of 100% Essential 8 Media will accompany each exposure period. RCTE cells cultured in RCTE growth media will serve as positive controls for each exposure period.

At the end of the trial period, we will use immunofluorescence techniques to quantify the extent of differentiation. The trials would be repeated and different antibodies used including aquaporin 1 (AQP 1), LHX1, GATA3, HOXD11 (UE), and EYA1(MM). [1] These antibodies will confirm or disprove the existence of renal proximal tubule, Ureteric Epithelium, and Metanephric Mesenchyme. [2, 3]

Scholarly Sources

1. Takasato, M., et al., *Kidney organoids from human iPS cells contain multiple lineages and model human nephrogenesis [Erratum to document cited in CA163:643946].* Nature (London, U. K.), 2016. **536**(7615): p. 238.
2. Xinaris, C., et al., *In vivo maturation of functional renal organoids formed from embryonic cell suspensions.* J Am Soc Nephrol, 2012. **23**(11): p. 1857-68.
3. Zhang, J., et al., *Aquaporin-1 translocation and degradation mediates the water transportation mechanism of acetazolamide.* PLoS One, 2012. **7**(9): p. e45976.