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PhD Research Activities

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Immortalized human renal epithelial cells for bioartificial kidney

My PhD project is involved in the optimization of Immortalized human renal epithelial cells culture for bioartificial kidney device. In general, proximal tubule epithelial cells (PTECs) are responsible for the majority of waste molecules and uremic protein-bound toxins removal. Specifically, in my project I am going to use conditionally immortalized proximal tubule epithelial cells (ciPTECs). First of all I will need to optimize the cell monolayer morphology on hollow fiber membranes. After that, I will study their functionality upon studying transporter specifically involved in uremic toxins removal.

The real goal will be to have a long term viable system that can be applied first in animal studies and then enter the clinical ones in order to develop a final product. It`s a hard challenge!

How do I seed cells on biomaterials?

That's quite funny actually. I use little tubes in which I put a fragment of the hollow fiber membrane, then I start with the sterilization, coating and cell seeding step. After 8 days (1 day of proliferation and 7 days of differentiation) I can perform the immunofluorescence staining in order to detect if there are cells on the membrane surface and if they are well connected with each other.

Things done and current work

For now on, I am focused on the ciPTEC monolayer optimization using Polyethersulfone (PES) HF membranes. **I have already demonstrated that bigger diameter corresponds to lower membrane curvature and allows cell attachment.** This I demonstrated by comparing twoPES-based HF membranes: HCO1100 and MICROPES. Those two membranes differ only in the diameter, the second ones are bigger and allowed ciPTEC attachment.

I also demonstrated that **L-dopa in combination with collagen IV is the optimal extracellular matrix (ECM) combination for now**, and I can focus on the optimization of the seeding process.

Of course all of this wasn`t that smooth: wrong steps, unsuccessful choices and techniques have been taken but I learnt from those ones.

The **following step will be to establish the functionality of the transporter involved in anionic uremic toxins removal.** Based on these results, if I get there, I can test human plasma samples. Exciting, eh?

What are my plans for the next months?

Well, first of all trying to succeed with some of my planned experiments in order to pile up some good data. In the meantime I will attend *New Frontiers in Regenerative Medicine*, an exciting Congress organized by the Radboud University in Nijmegen. In conclusion, I hope I will have a student sometime next year, I really need an extra help. It would be useful!