Combining Engineering and Biology Organs-on Chips

Disruptive and Innovative









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Spinal Motor, Midbrain Neurons and BMECs are Generated from Human iPSCs.



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 Brain microvascular endothelial cells (BMECS) are generated in distinct protocol (Lippman et. al. 2018).

 Spinal motor neuron (spMN) progenitor cultures are matured into MNs in as little as 18 days days using internal protocol.

 Midbrain patterned neural progenitor cultures contain TH+ DA Neurons after 30 days in culture. (Modified Kriks et. al 2011)

Additional cell types survive in long term Chips

- A diMNs SMI32/Isl1
- A BMEC Glut1
- B Astrocytes GFAP/s100b
- C Microglia Iba1



Sam Sances











- Increased α -synuclein levels in EOSPD mDA cultures by western blot and ELISA



Laperle et al, submitted

Lysosomal pathways are impaired in EOSPD mDA cultures



- Lysosomal associated membrane protein 1 (LAMP1)
- GCase Lysosomal hydrolase



p-PKC α is elevated in EOSPD mDA cultures



- PKC α phospho Thr-638 controls the rate of agonist induced dephosphorylation and inactivation of the protein
- Increased activity is associated with other neurodegenerative diseases (Alzheimer's)

Phorbol ester compounds reverse the phenotype





Laperle et al, submitted

From BBB-Chip to Brain-Chip



Calcium Imaging show active neurons in chip

Automated quantification of calcium transients in Chips

- Detects up to 1000 neurons in each chip
- Determines firing rate pattern for each individual neuron
- Can be registered to neuron post fixation and analysis
- Drugs can be given to blood channel and effects on neural activity monitored





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