Twitter Thread by Smit Patel

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Super excited to share my very first lead-author paper in @ScienceAdvances

Supported by @HIRN_CC @NIDDKgov @UFBME @UFWertheim @ufdiabetes @UMCoEDean
Lead by @Cherie_Stabler & @ashu83

link: https://t.co/FbqVWQ0n5p

This is a thread ■

Highlights:
■■A Lab-on-a-Chip platform for organoids w/ wide capabilities: long-term culture | controlled & dynamic perifusion | in situ spatio-temporal imaging | serial cell assessment | ease of sample retrieval

■■Continuous fluidic flow increased local oxygen supply to islets in hydrogels & reduced cellular hypoxia
■■Flow increased cellular viability & reduced apoptosis & cell death

■■Human islets in hydrogels were highly functional during the 10 day in situ culture in our chips, while islet function was rapidly lost under static conditions
■■Glucolipotoxicity study showed a treatment window as small as 2.5 hours can elevate cell death

What are organoids? – A miniaturized version of an organ that imitate an aspect of human interface. They are commonly developed from stem cells in a lab. Human body also produces organoids naturally particularly within the pancreas.

Think of organoids like a microscopic version of raspberries comprised of small spheres. These raspberry-like organoids in the pancreas are called the islets that manufacture insulin and maintain glucose homeostasis.

Photo: Raspberry | Islet (yellow = insulin & blue = cellular nuclei)

Problem: Culturing organoids traditionally lead to precipitous loss of cell mass & fxn. This is at least due to oxygen deprivation & the lack of nutrient exchange. Tools used to evaluate islet fxn also make it hard to recover cells as they are trapped in a device or a slurry.

Our Solution: Lab-on-a-chip platform
What is this technology? It is a replica of a specific organ interface on a microchip. Our device mimics the dynamic environment of the islet niche by providing a microfluidic flow to islets that are also embedded in a 3D gel.

Our device can allow live-cell imaging to do cool studies.
Here, beta cells within an islet treated with high glucose + lipotoxic agent (left) shows elevated calcium signaling (GCaMP) compared to those treated with basal level of glucose (right) while showing cell death.

Future work: Further investigation on the role of shear stress in maintaining islet function. Expand throughput & in situ functional assessment w/o sacrificing ease in usability. Study temporal interactions between complex matrices and other 3D organoids.

Checkout my personal journey that ultimately produced this research article & what this all means to me through this video■■■ https://t.co/unEdSYfiw0

This was a highly collaborative effort excellently lead by @Cherie_Stabler & @ashu83. My deepest and most sincere appreciation goes to my co-first author @MattIshahak, mentors @Deborah_Chaimov, @PhelpsLab_UF, Dr. Peter Buchwald (@umiamimedicine) and colleagues…

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Additionally, I would like to acknowledge the unsung heroes including all my lab members at the Stabler Lab, my partner, and family members. Thank you for your insights, critics, and putting up with my countless MIA hours!

If you are curious about any specifics, please reach out to me directly! Looking forward to your interesting questions.

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