

Using 3D Printing to Develop a placenta-on-a-chip model

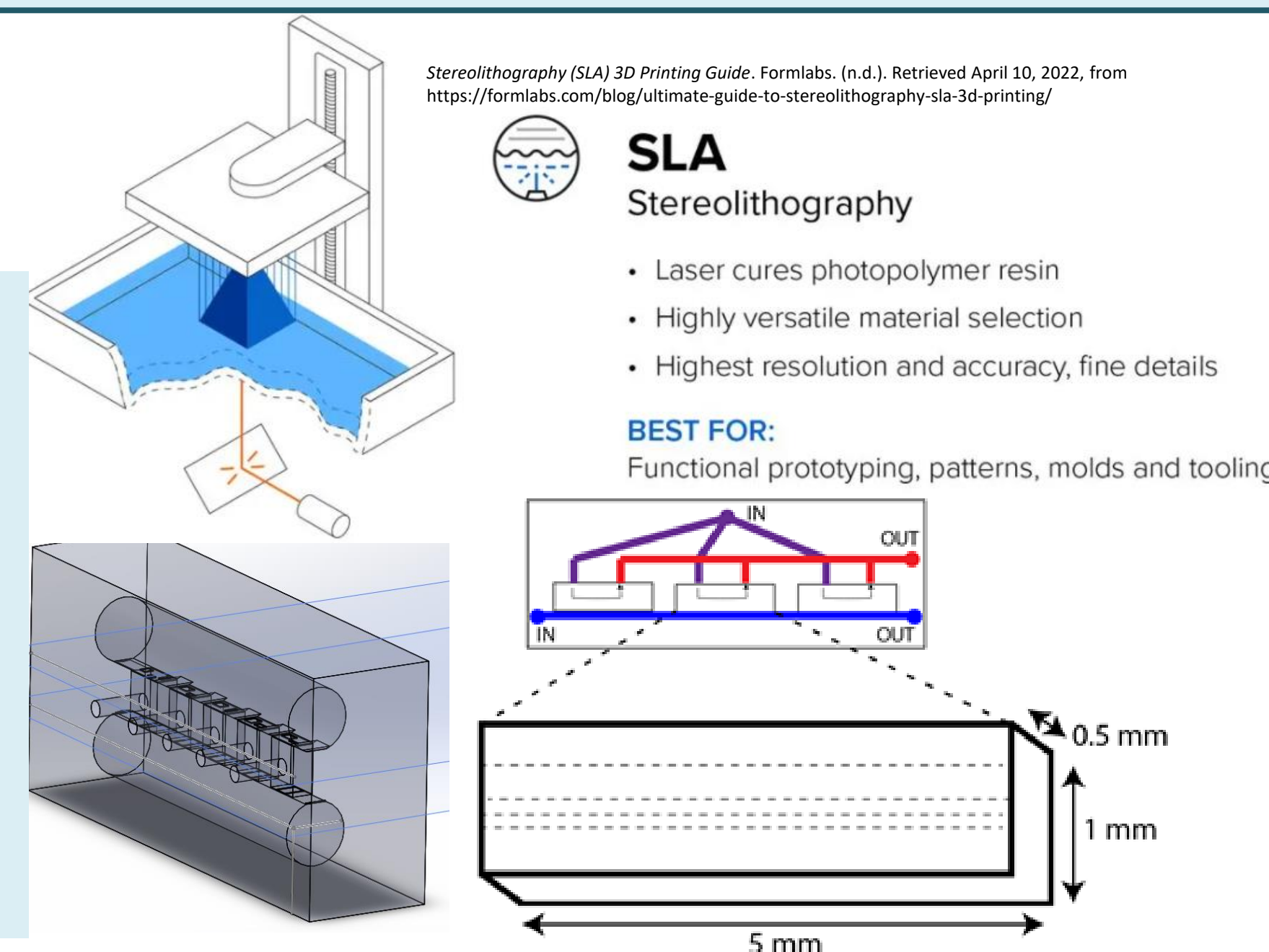
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ABSTRACT

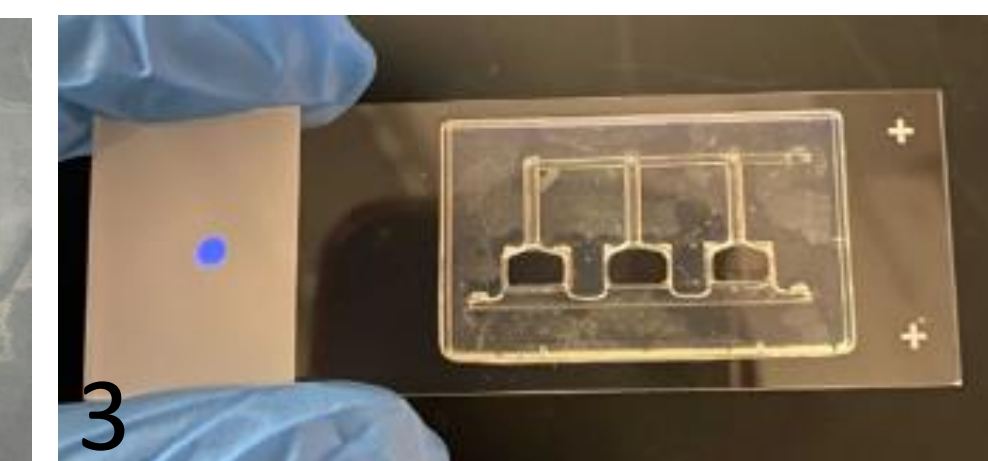
Placental trophoblasts support fetal growth and survival, but the behavior of these cells is challenging to study in vivo and in two-dimensional culture systems. In this project we investigate the use of 3D printing to generate an on-a-chip platform to study trophoblast behavior. We evaluated the feasibility of printing the chips on glass slides and optimized chip design printing with clear resin. Future studies will investigate the feasibility of trophoblast culture and analysis on the fabricated chip.

BACKGROUND

Tissue on a chip systems offer a unique way at studying systems in-vitro. Furthermore, this system offers a 3D contained environment to study cellular growth, fluid exchange, and cytocompatibility of different biomaterials. Using 3D printing also speeds up the prototyping time and allows for easy design changes.



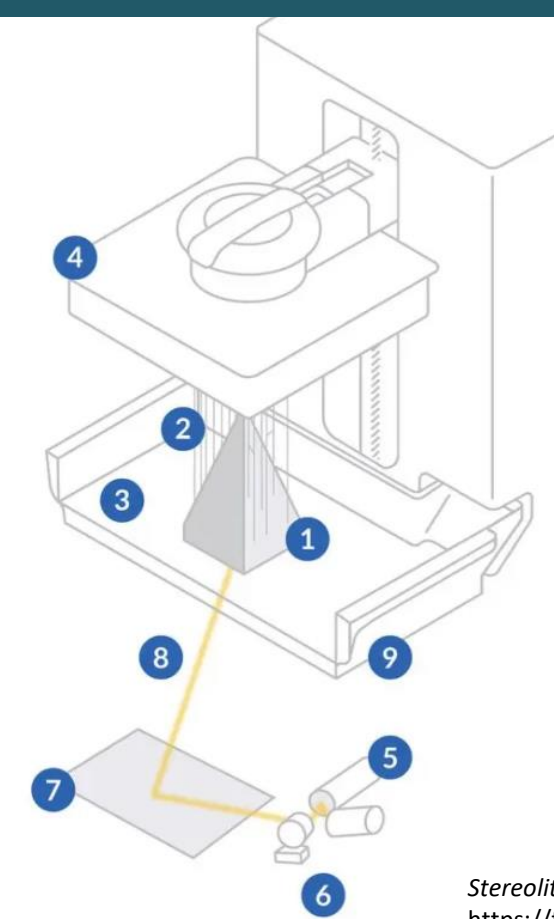
RESULTS



- 1) Chip design
- 2) Failed autoclave
- 3) Channel design

The best way at bonding the chip to the glass slide was in the post-cure of the chip in the oven at 60°C for 15 minutes.

METHODOLOGY



Upside-Down (Inverted) SLA

- 1 Printed Part
- 2 Supports
- 3 Resin
- 4 Build Platform
- 5 Laser
- 6 Galvanometers
- 7 X-Y Scanning Mirror
- 8 Laser Beam
- 9 Resin Tank

Stereolithography (SLA) 3D Printing Guide. Formlabs. (n.d.). Retrieved April 10, 2022, from <https://formlabs.com/blog/ultimate-guide-to-stereolithography-sla-3d-printing/>

SOLIDWORKS model

Formlabs 3 printing with clear resin

Post cure / glass slide fusion

FUTURE WORKS

Alcohol wash of chips for cytocompatibility

Place organoids into the chip and live/dead image with confocal microscopy

Redesign the chip channels to better model the fluid exchange of the placenta