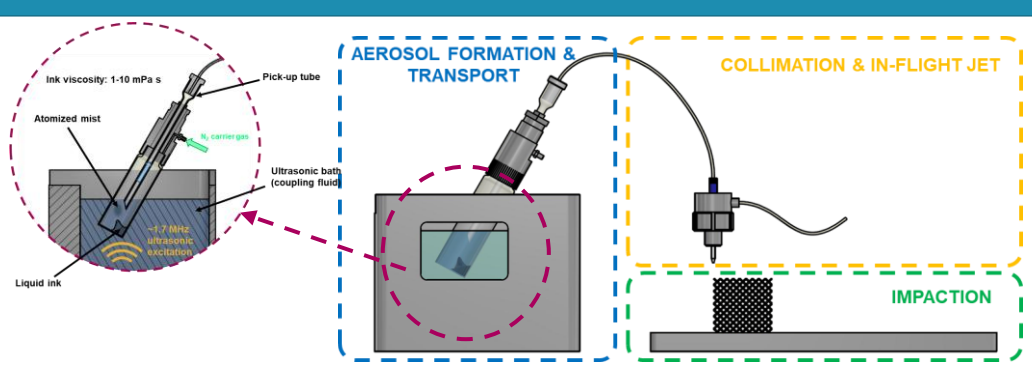
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3D Aerosol Jet® Printing of gold nanoparticle ink for bio-conductive micro-patterns guiding Schwann cell migration towards nerve conduits

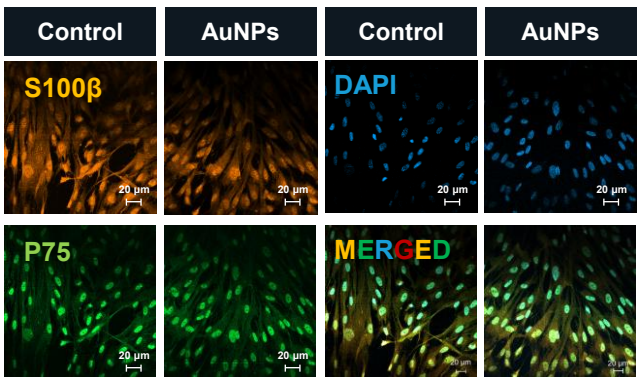
Aerosol Jet® Printing

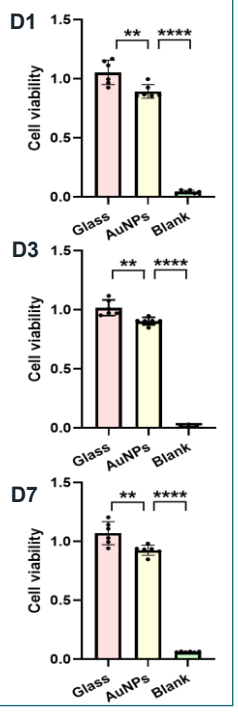


- Broad range of **functional inks** (metal, polymers, hydrogels), viscosity (1 cP to 1000 cP), and substrates (flat, 3D shaped, flexible, rigid, textile, etc…).
- High printing resolution down to **15 µm** in-plane and **150 nm** in thickness; max print speed **200 mm/s.**
- Enables **3D printing**.

In vitro biocompatibility and differentiation potential of AuNPs ink

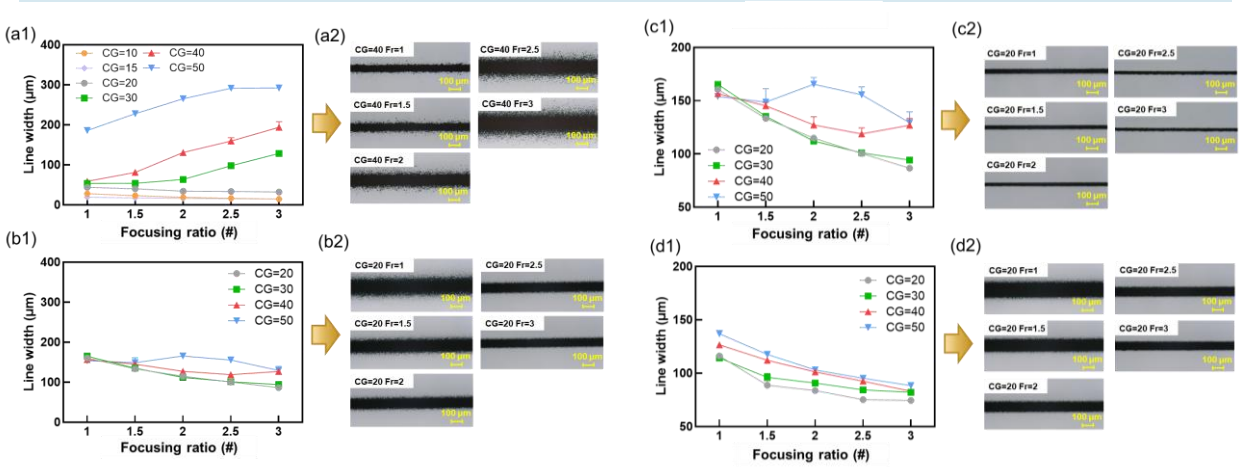
Gold nanoparticle (**AuNPs**) coating provides stable support for human dental pulp stem cell-derived Schwann cells (**DPSC-SCs**) adhesion and morphological maintenance.





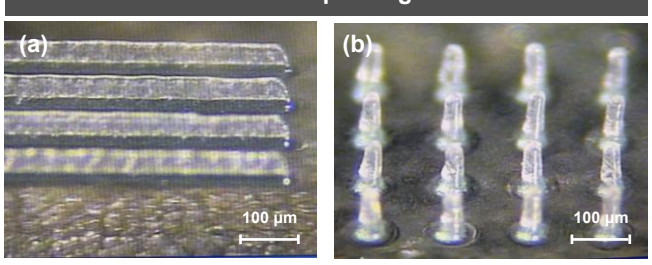
Printing process investigation

- Carrier gas (**CG**) is the **dominant factor** governing **line width**.
- Focusing ratio (CG/SG(sheath gas)) and nozzle diameter jointly regulate the jet shape and deposition accuracy.
- Printing speed partially compensates for the diffusion effects induced by high CG.

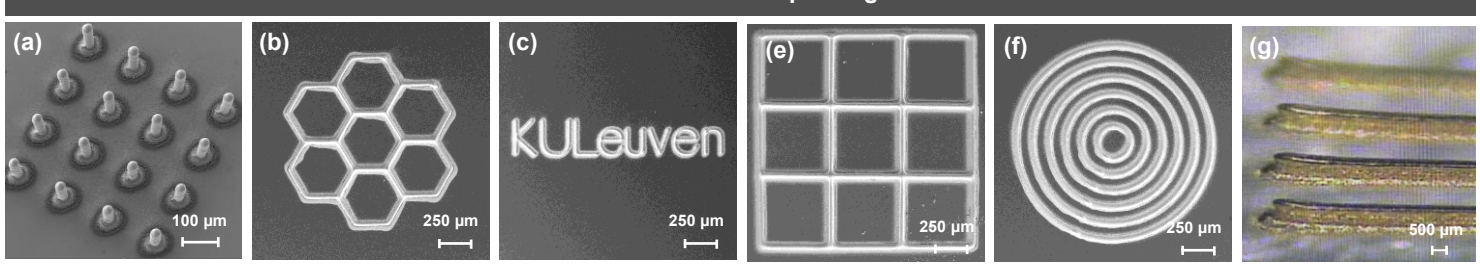


3D AJ-Printing of AuNPs and ColMA for next

ColMA printing

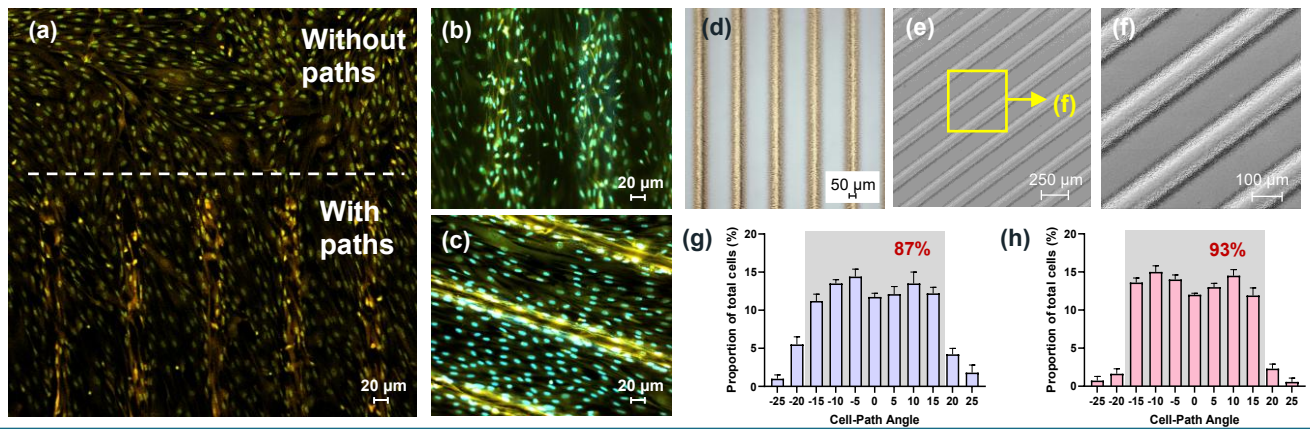


AuNPs printing



DPSC-SC oriented migration on the AJ-printed AuNPs pathway

- **73%** of DPSC-SCs adhesion on 100/160 (line width/gap) µm AuNPs pattern.
- **93%** of DPSC-SCs exhibited a distinct **directional alignment** along the AuNP pathways (40/160 µm).



Conclusion and perspectives

- AJ®P enables precise and reproducible fabrication of conductive AuNPs microstructures with electro-biological functionality.
- Printed AuNPs microstructures support hDPSC-SC survival, phenotype stability, and guided growth.
- Provides a feasible manufacturing strategy and mechanistic insight for next-generation bioelectronic NGCs.
- Lay the foundation for advanced bioelectronic devices.

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