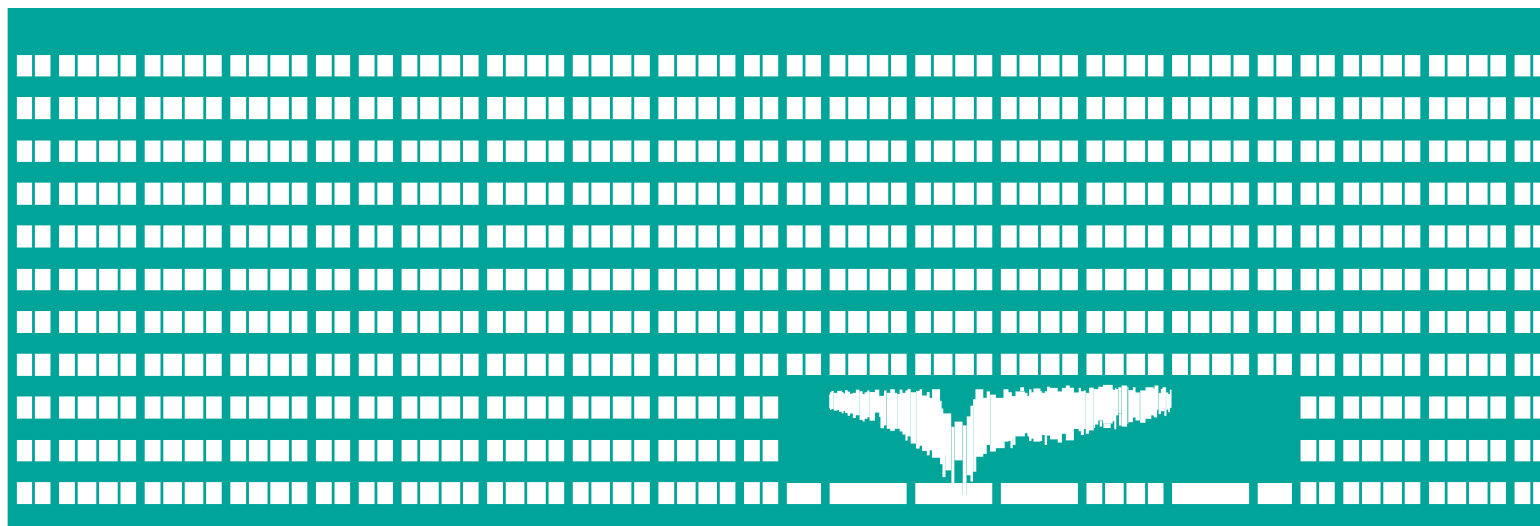




University Journal Club

Potential Applications of Bioprinting in Head and Neck Cancer Research

Ing. Phu Ma Quoc

VŠB-TUO, Faculty of Mechanical Engineering



Who We Are

- OU: academic coordination
- FNO: clinical and biology
- VSB-TUO: 3D printer and material development

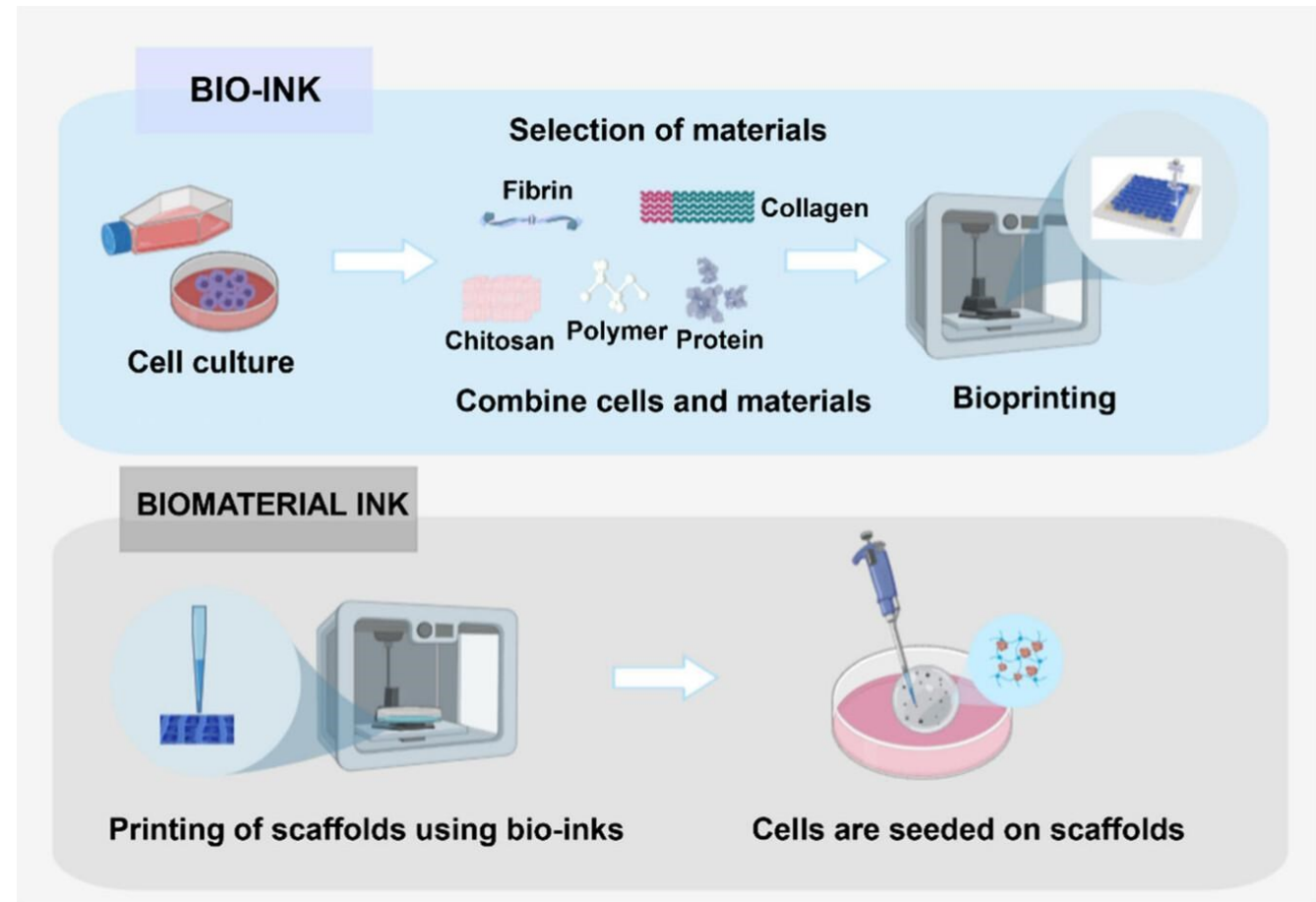
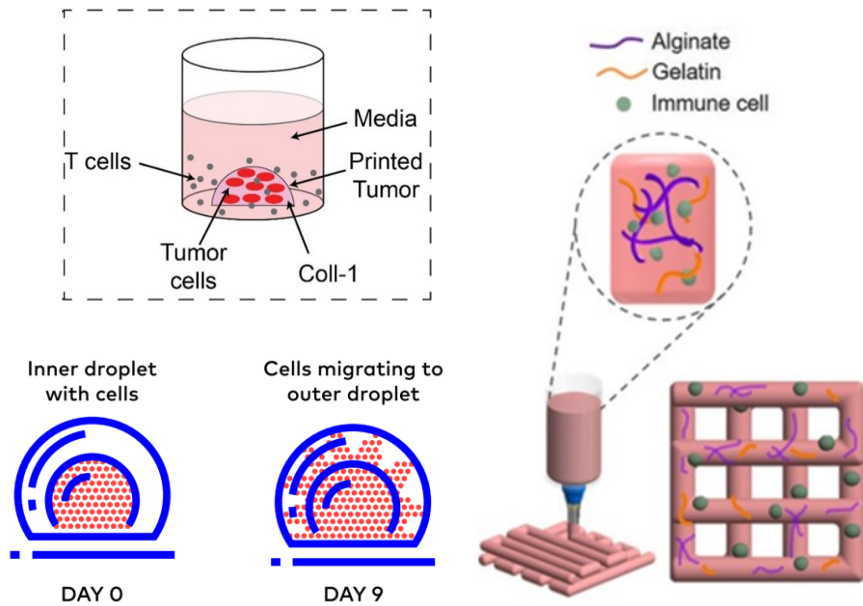


BIO X6 (Cellink)



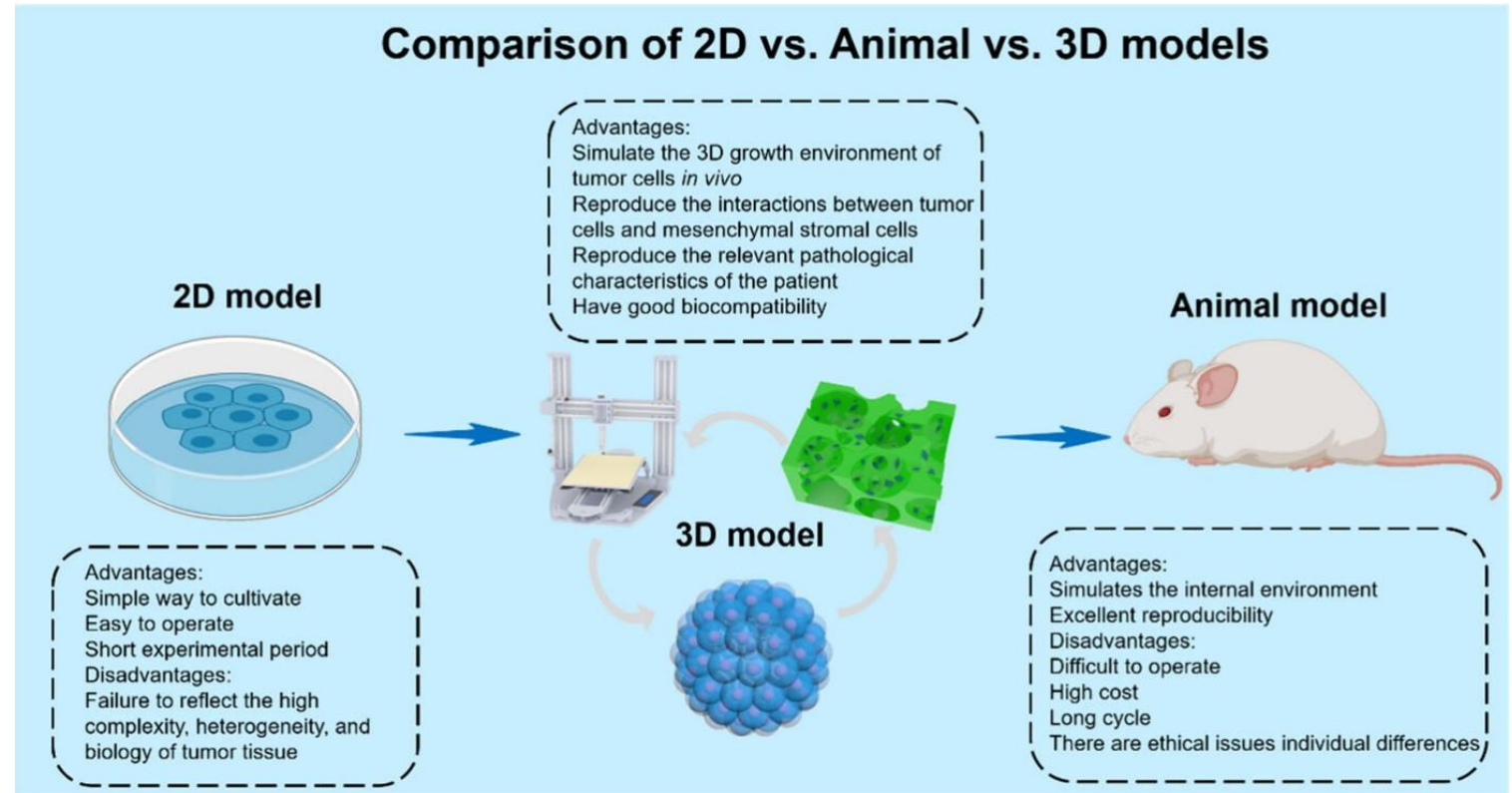
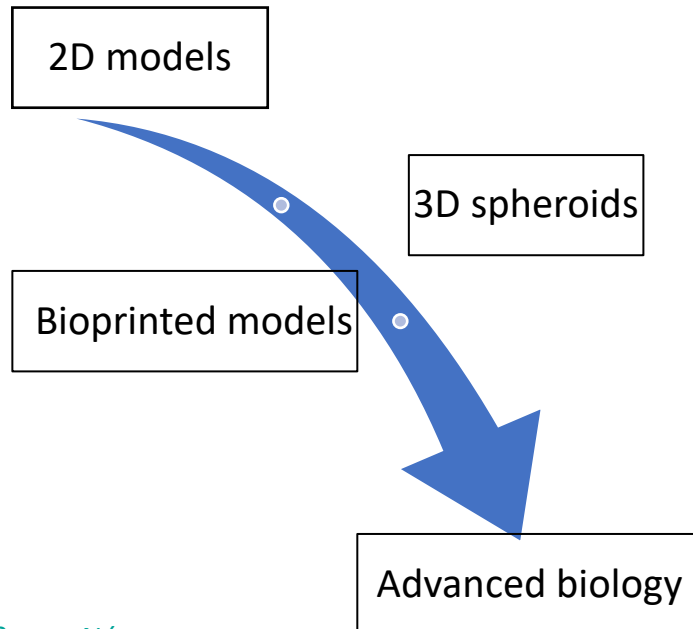
Research Focus

- Droplet
- Scaffolds/Extracellular Matrix (ECM)



Research Focus

- 2D cultures lack tumor microenvironment (TME)
- 3D models reveal drug resistance & invasion



Road map

- Detailed milestones:

Introducing the BIO X6™ 3D Bioprinter

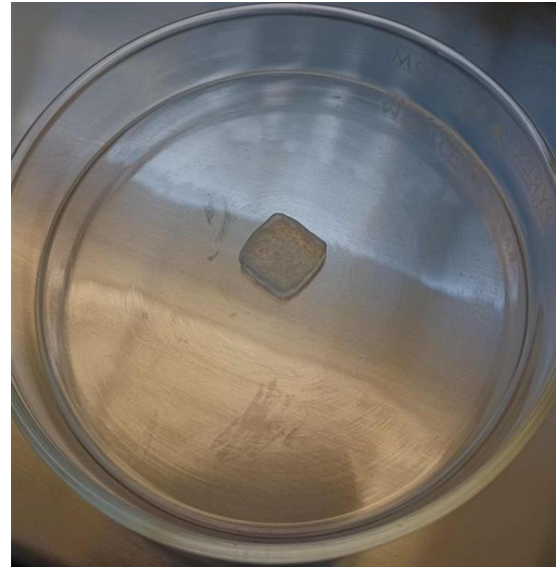
Designed to help you push past research boundaries and create the future of medicine.



	Phase I (0–6 months)	Phase II (6–12 months)	Phase III (Year 2+)
Milestones	• Build & standardize: CAL-27 + FaDu spheroids (ULA). • Embed spheroids in GelMA gel $\pm$ fibroblasts. • First assays: 2D vs 3D drug sensitivity (EC50 shift), invasion distance, day-7 viability.	• Compare ECMs (GelMA vs collagen/fibrin). • Adjacent lanes (tumor vs fibroblasts) for directional invasion. • Add endothelial cells for perfusion/hypoxia models.	• PNI pilot: tumor vs neuron/Schwann cell constructs. • Immune cell assays: NK / CAR-T infiltration & killing. • Patient-derived CAFs and organoids (PDOs).
Deliverables	• 3–5 grant-ready figures • Data package for GAČR/AZV • 1 conference abstract	• 1 manuscript • Comparative ECM dataset • Follow-up grant applications	• Advanced grant proposals (EU) • 1–2 high-impact manuscripts • Platform visibility (international)

Key results

- Hyaluronic Acid (HA) (2 wt.%) with additives:

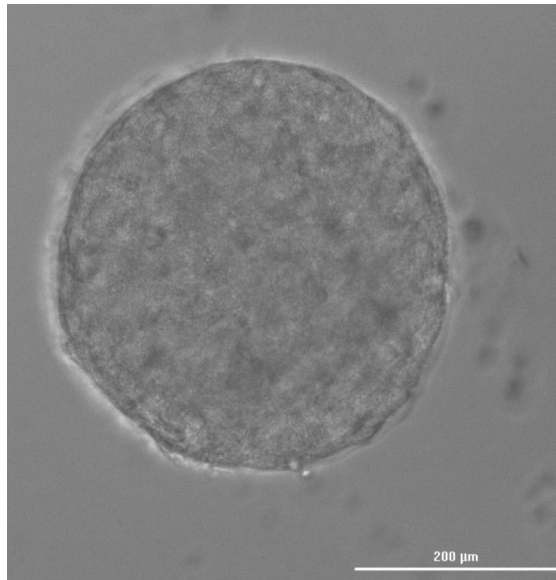


Chitin Nanocrystals (ChNCs)
1 mg/ml (left) and 2 mg/ml (right)

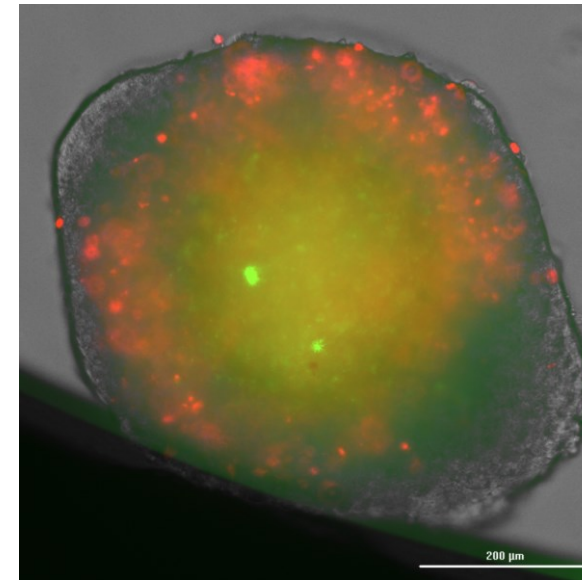
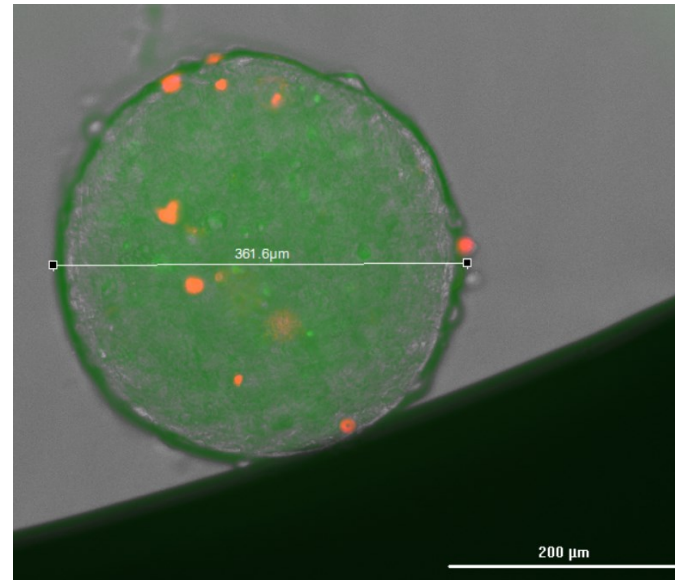
more additives of nanofiller
keep the shape, due to
increasing the interaction
between the components

Key results

- Spheroid cultivation. Two cancer cell lines: CAL27 (tongue) and FaDu (throat)



FaDu
500/1000/3000/5000 cells



Live/Dead staining (Day 2 – Day 14)

Fluorescent compound to assess cell viability.

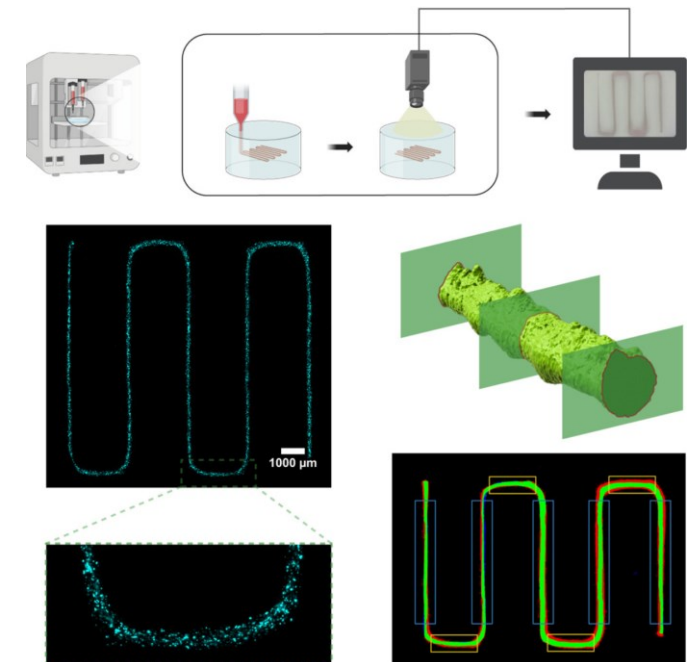
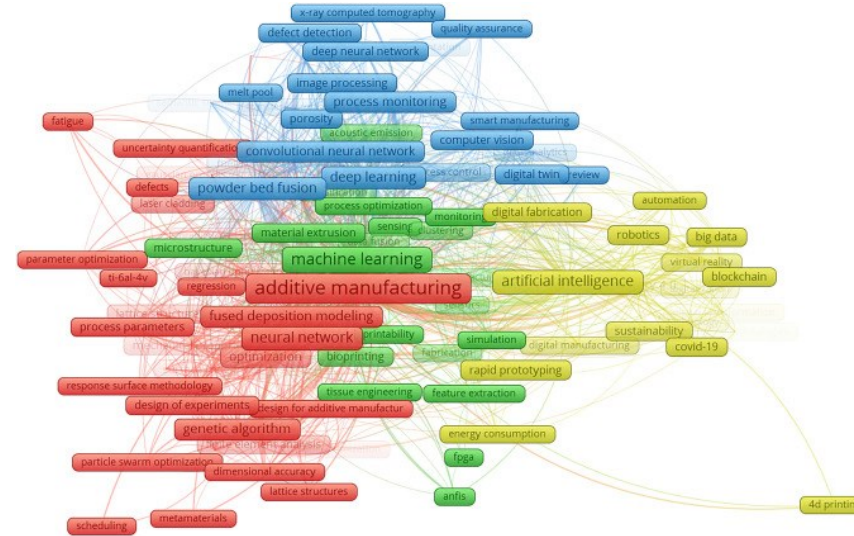
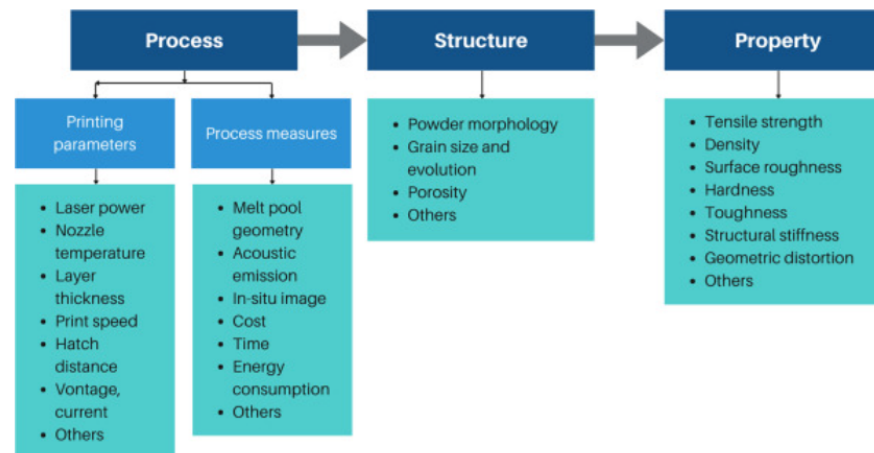
Green (alive, dye CalceinAM).
Red (dead, dye propidium iodide).

Media (DMEM, antibiotics pen/strep, serum FBS and non-essential amino acids)

Potential Cooperation

Machine learning application to optimize printing process:

- Process optimization (optimal design, printing process, and mechanical properties)
- Defect detection and monitoring (images or acoustic emissions for defect detection and monitoring)



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