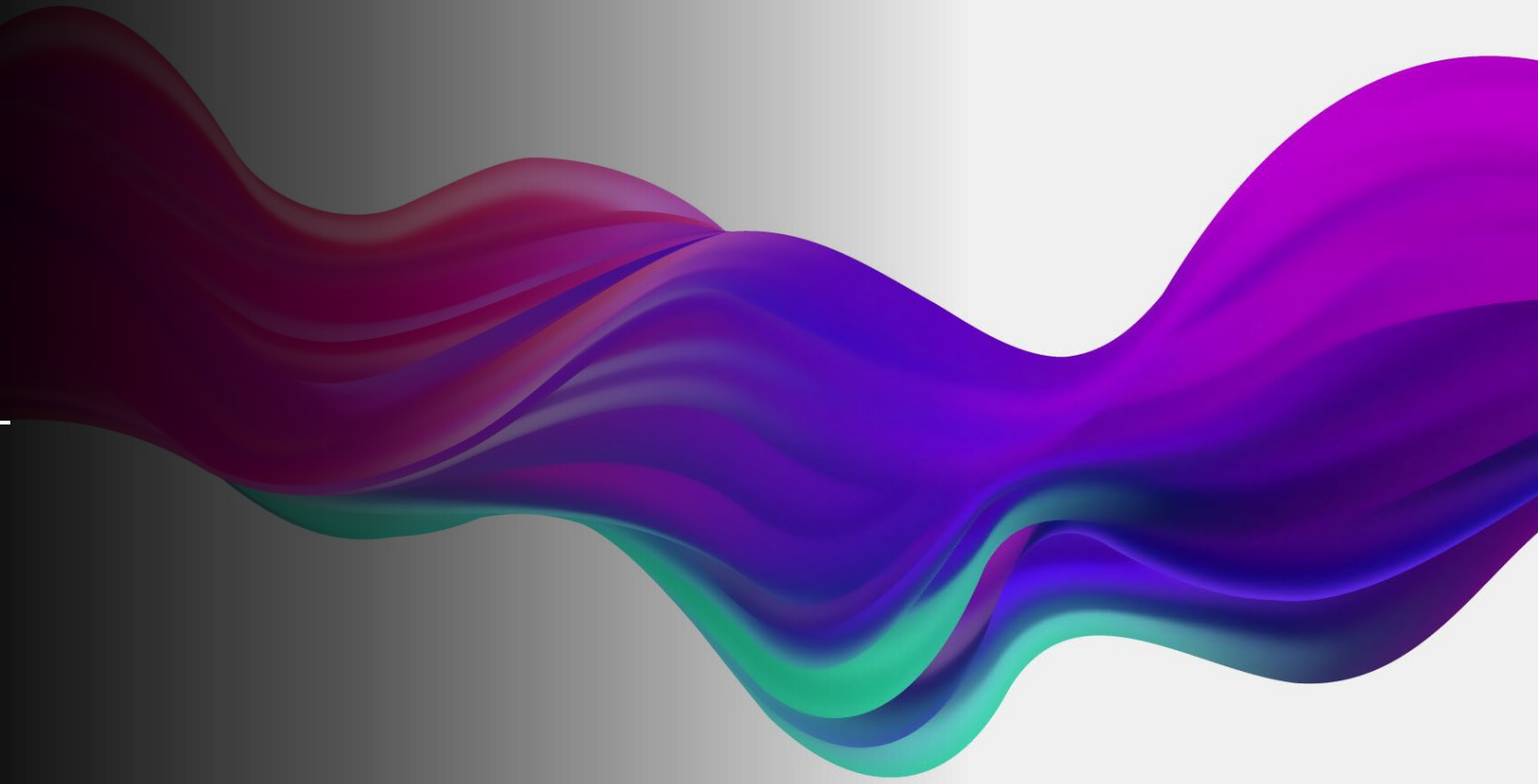
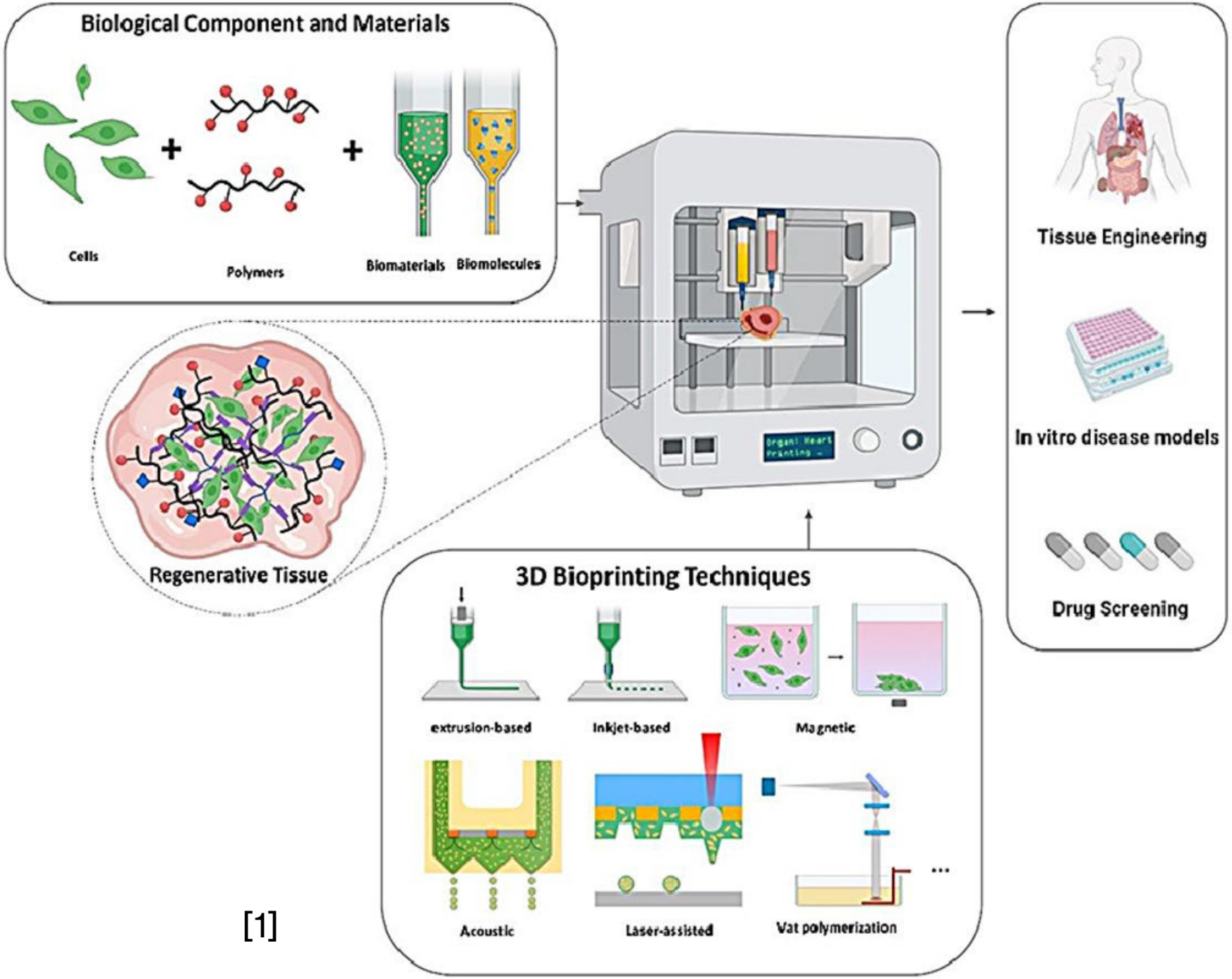
Cryoprinting Hydrogels

Nivi Chandra Bose

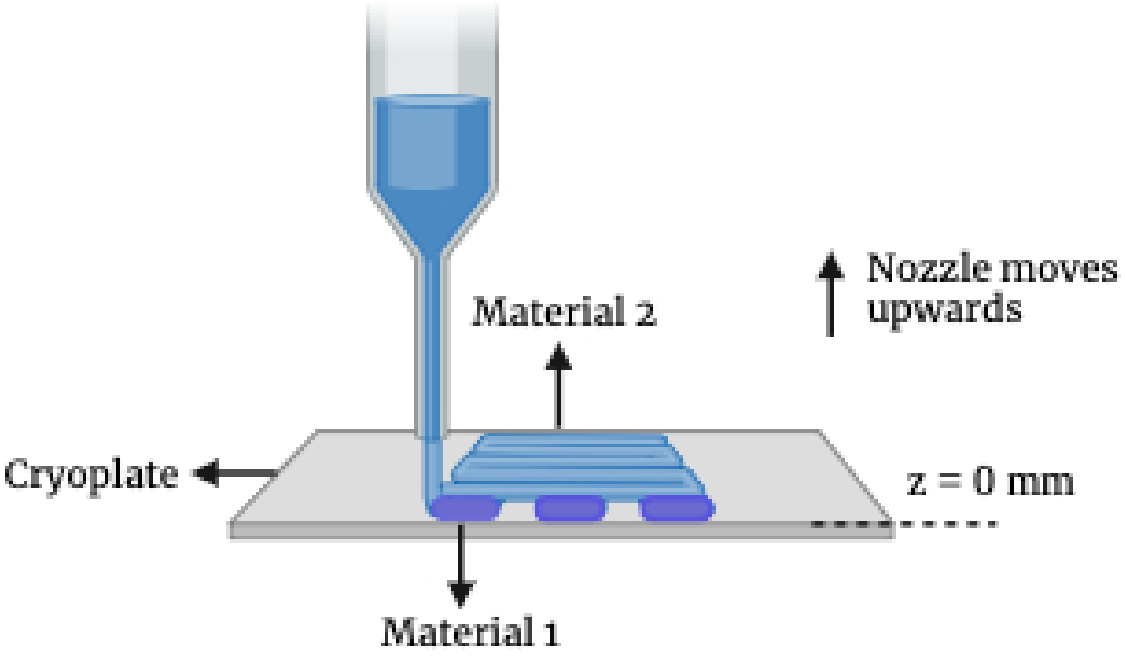


3D Bioprinting

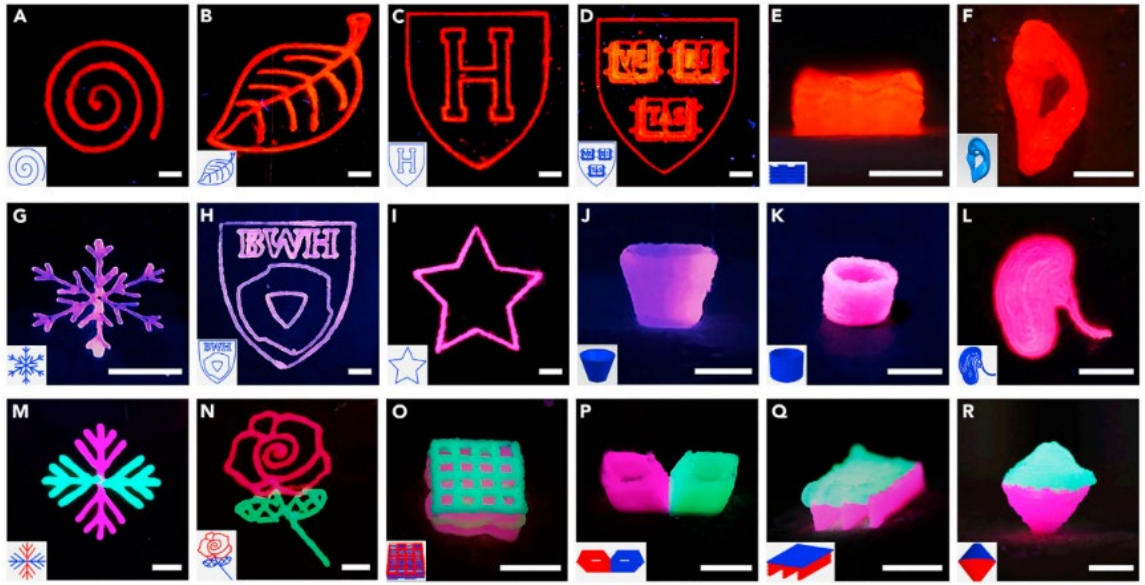


[1]

Cryoprinting

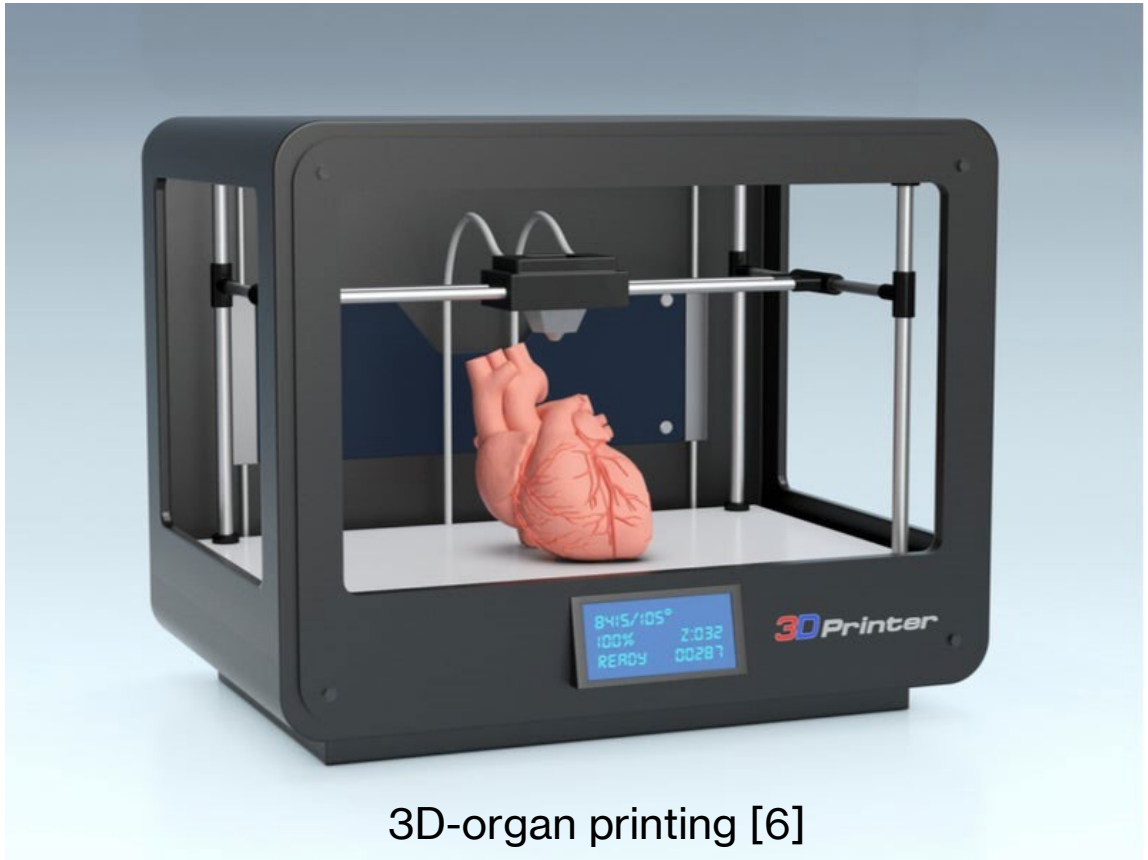


Schematic of multi-material 3D cryoprinting



Cryoprinted structures [2]

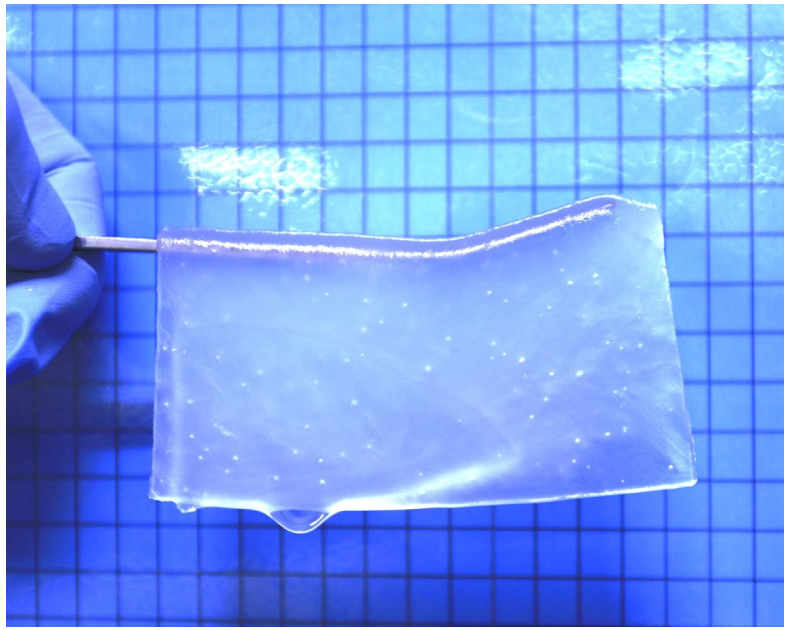
Applications



3D-organ printing [6]

3D tissue constructs [7]

Hydrogels

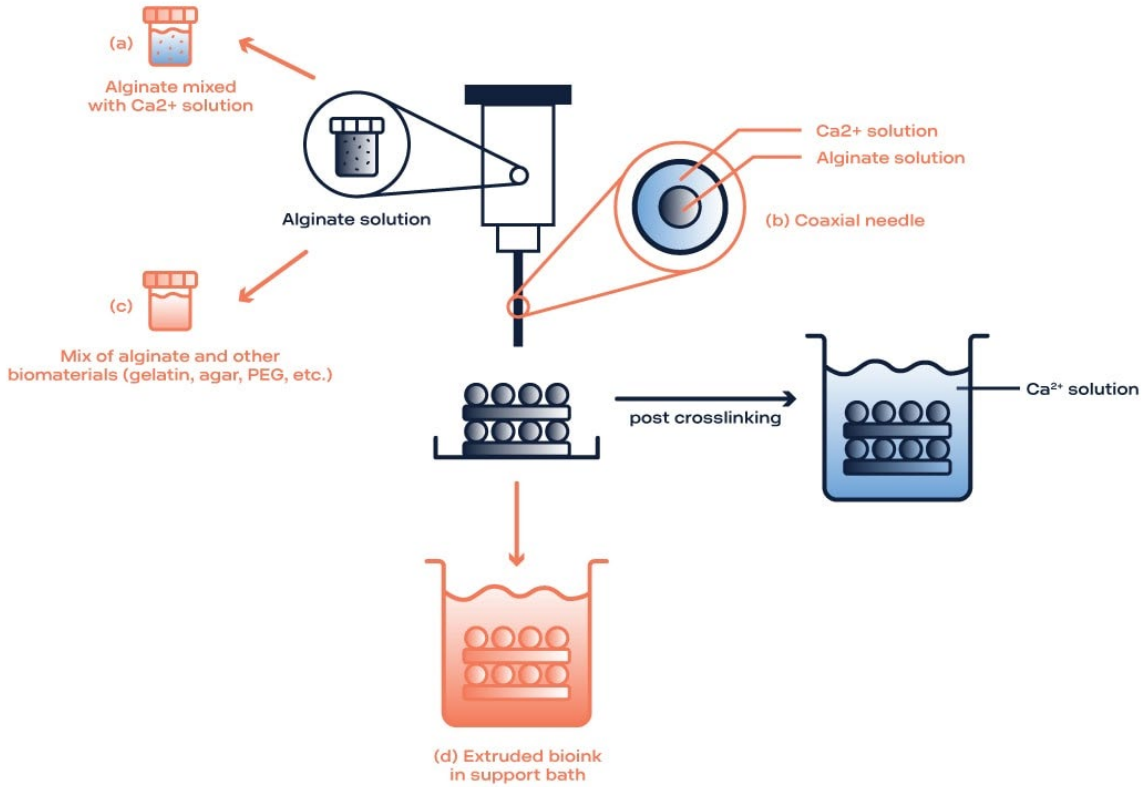


A semi-transparent hydrogel [3]

Applications of hydrogels in biomedicine [4]

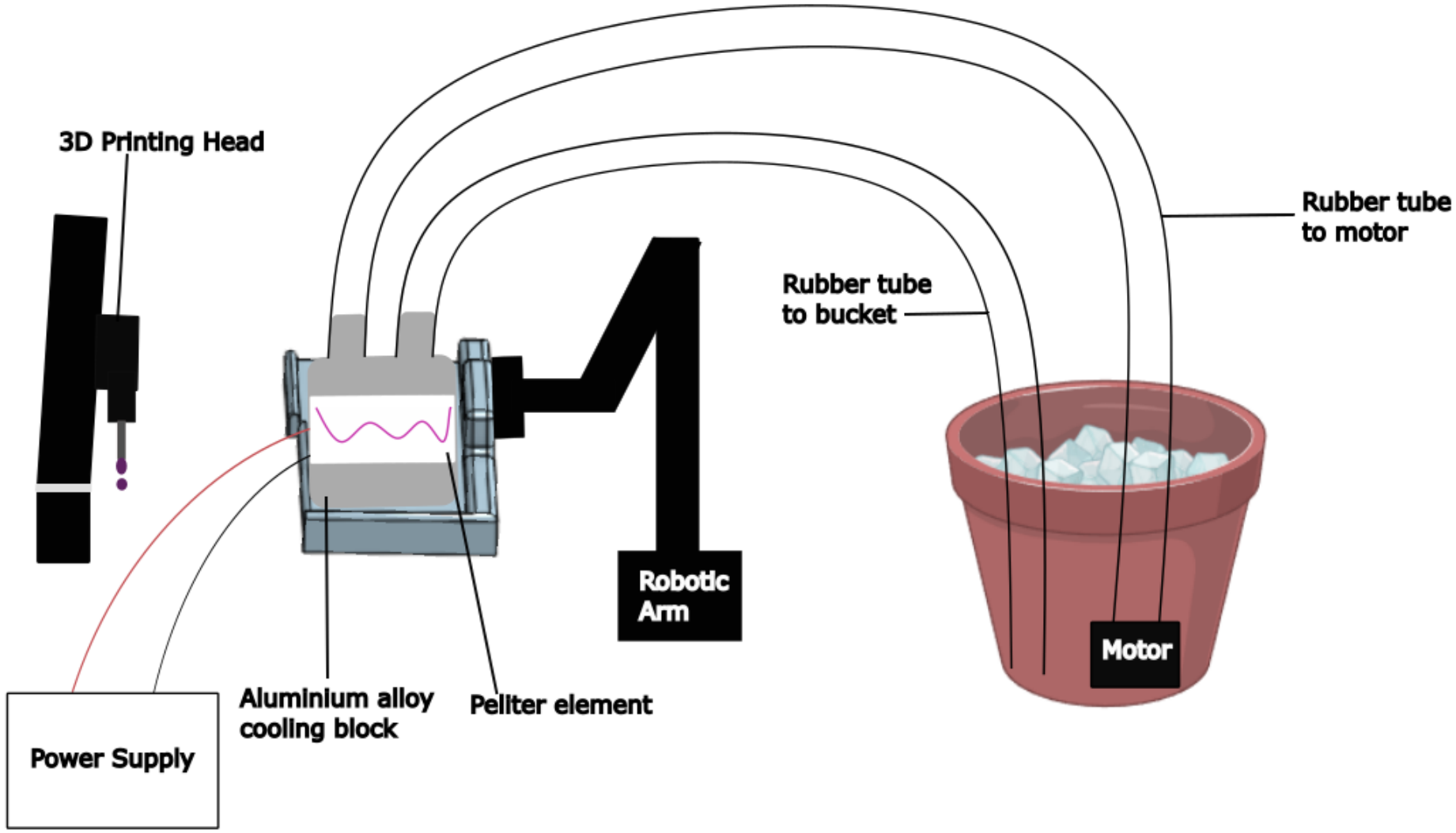
Alginate Hydrogel

Attempts at 3D extrusion printing of alginate

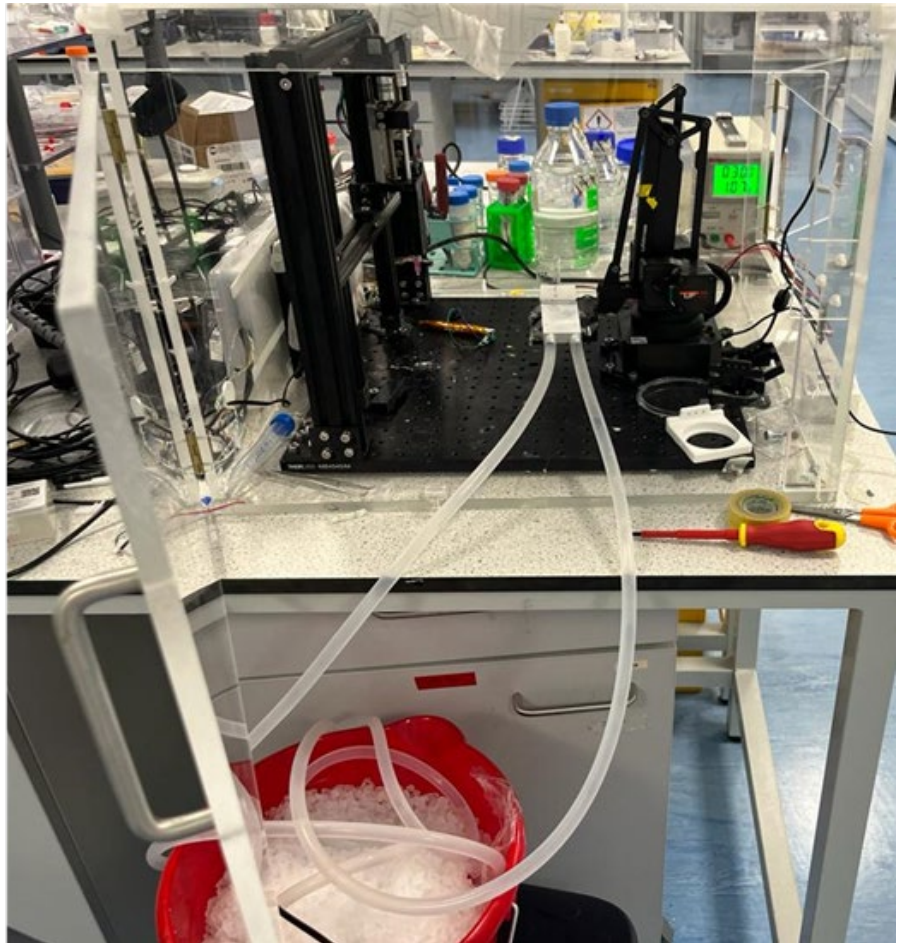


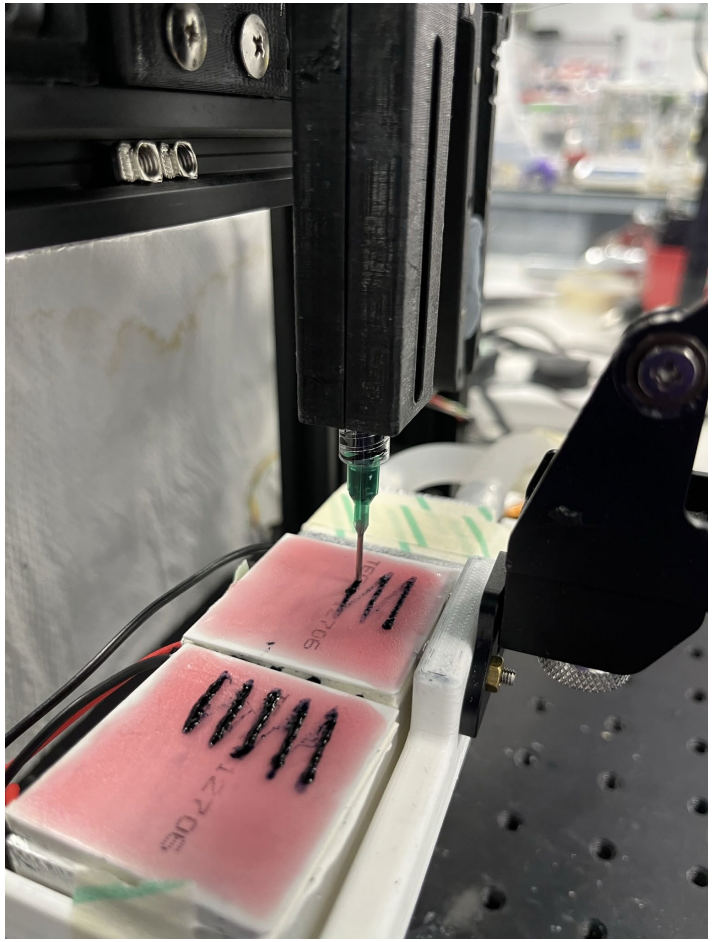
Methods of 3D printing pure alginate [5]

Cryoprinting Platform



Cryoprinting Platform





References

[1] Vanaei, S., et al. (2021) 'An overview on materials and techniques in 3D bioprinting toward biomedical application', *Engineered Regeneration*, 2, pp. 1-18.

[2] Ravanbakhsh, H., Luo, Z., Zhang, X., Maharjan, S., Mirkarimi, H.S., Tang, G., Chávez-Madero, C., Mongeau, L. and Zhang, Y.S., 2022. Freeform cell-laden cryobioprinting for shelf-ready tissue fabrication and storage. Matter, 5(2), pp.573-593.

[3] Tanikawa, S., et al. (2023) 'Engineering of an electrically charged hydrogel implanted into a traumatic brain injury model for stepwise neuronal tissue reconstruction', *Scientific Reports*, 13(1), p.2233.

[4] Kapusta, O., et al. (2023) 'Antimicrobial Natural Hydrogels in Biomedicine: Properties, Applications, and Challenges – A Concise Review', *International Journal of Molecular Sciences*, 24(3), p.2191.

[5] Bonizol Camasao, D. (2021) 'Methods to 3D print alginate-based scaffolds', Rheolution Article, January. Available at: https://rheolution.com/rheolution-articles/methods-to-3d-print-alginate-based-scaffolds/#:~:text=Some%20reported%20methods%20include%20(Section,and%20core%2C%20respectively%2C%20for%20rapid (Accessed: 1 June 2024).[6] Sanchez-Sanchez, A., del Agua, I., Malliaras, G.G. and Mecerreyes, D., 2019. Conductive poly (3, 4-ethylenedioxythiophene)(PEDOT)-based polymers and their applications in bioelectronics. In *Smart Polymers and Their Applications* (pp. 191-218). Woodhead Publishing.

[6] Kent, C. (2019, June 10). The future of bioprinting: A new frontier in regenerative healthcare. Medical Device Network. Retrieved June 14, 2024, from https://www.medicaldevice-network.com/features/future-of-3d-bioprinting/

[7] Carnegie Mellon University. (n.d.). Three-dimensional tissue constructs. Retrieved June 14, 2024, from https://engineering.cmu.edu/organs/research/3d-tissues.html