

# 3D BIO-SCAFFOLD FOR CONTROLLED RELEASE OF LIPID NANOPARTICLES

## IN POST-SURGICAL GBM THERAPY

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### INTRODUCTION

Glioblastoma multiforme (GBM) is the most aggressive primary brain tumor (median survival < 15 months).

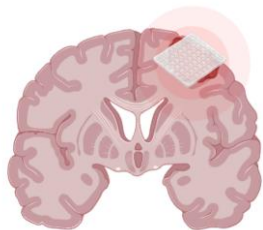
Standard care (Stupp protocol) fails due to:

- Incomplete surgical resection.
- Limited drug penetration through the Blood-Brain Barrier (BBB).

Local delivery via implantable 3D bio-scaffolds offers a direct therapeutic route within the resection cavity.

### AIM OF THE STUDY

Development of a 3D bioprinted alginate/gelatin scaffold loaded with fluorescent lipid nanoparticles (NPs) for tunable, site-specific drug release in GBM post-surgery.



### METHODOLOGIES

**Bioink:** Sodium alginate & Gelatin Type B (Formulations A-E).

**Lipid NPs:** Synthesized and characterized via DLS for size, PDI, and colloidal stability.

**Bioprinting:** Dr. INVIVO 3D bioprinter (grid pattern, 10% infill).

**Cross-linking:** Dual strategy (Ionic CaCl<sub>2</sub> + Chemical Glutaraldehyde)

### NP CHARACTERIZATION

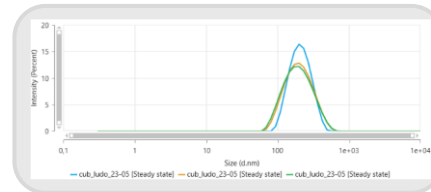


Fig 1. DLS size distribution of lipid nanoparticles

Size (nm)	PDI	Particle Concentration (particelle/mL)
175.9	0,1773	≈ 1,2 × 10 <sup>9</sup>

Tab.1 Size, PDI and particle concentration of lipid nanoparticles

### RESULTS

**Bioink D** (9% gelatin / 6% alginate) showed optimal extrusion texture and geometric fidelity.

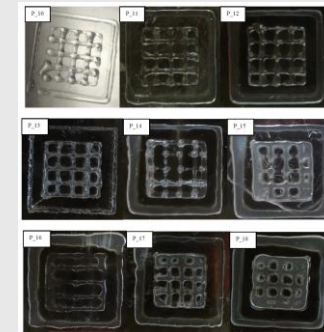


Fig 2. Optimization of 3D printing grid patterns (P10-P18)

### CONCLUSIONS

The developed 3D bio-scaffolds represent an innovative, implantable therapy for targeted, post-surgical glioblastoma treatment.

### ACKNOWLEDGEMENT

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