

# Green Nanotechnology for Glioblastoma Therapy: A Sustainable Biomedical Approach

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As global demand for sustainable technologies accelerates, the intersection of nanotechnology, green energy, and healthcare offers transformative opportunities for innovation [1].

In the workshop organized by **Albanian Women in Nanotech (AWIN)**, focused on green energy and nanotechnology, I would like to present a recent study investigating a biodegradable polymeric nanosystem for targeted drug delivery in glioblastoma (GBM) therapy [2]. This system is based on two biocompatible and biodegradable polymers: hyaluronic acid (HA) and polyarginine (PA), chosen for their established safety profiles [3]. Given the highly immunosuppressive tumor microenvironment characteristic of GBM [4], this nanosystem was designed not only to selectively target glioblastoma cells, but also to stimulate the immune system by inducing immunogenic cell death (ICD). The nanosystem was synthesized using the ionic gelation technique and loaded with diaminocyclohexane-platinum (II) (DACHPt), a derivative of oxaliplatin known to induce ICD [3].

Our findings suggest that this nanosystem holds strong potential as a therapeutic strategy that targets both tumor cells and immunosuppressive components of the tumor microenvironment [2]. Moreover, its biodegradable composition contributes to reduced medical waste, aligning with sustainability goals.

By exploring the synergy between green energy solutions and biomedical nanotechnology, we aim to foster collaborative, sustainable strategies that advance both environmental sustainability and human health, paving the way for a healthier, greener, and more equitable future.

## References

- [1] Zhang, Yuhang et al., (2023) "Sustainable Nanomaterials for Biomedical Applications." *Pharmaceutics* vol. 15,3 922.
- [2] Tushe, A. et al. (2025) 'Drug-loaded nanoparticles induce immunogenic cell death and efficiently target cells from glioblastoma patients', *Nanomedicine*, 20(11), pp. 1223–1234. doi: 10.1080/17435889.2025.2497747.
- [3] K. Matha et al., "Bioinspired hyaluronic acid and polyarginine nanoparticles for DACHPt delivery," *Eur. J. Pharm. Biopharm.*, vol. 150, pp. 1–13
- [4] L. Pinton et al., (2019) "The immune suppressive microenvironment of human gliomas depends on the accumulation of bone marrow-derived macrophages in the center of the lesion," *J. Immunother. Cancer*, vol. 7, no. 1, p. 58

## Figures

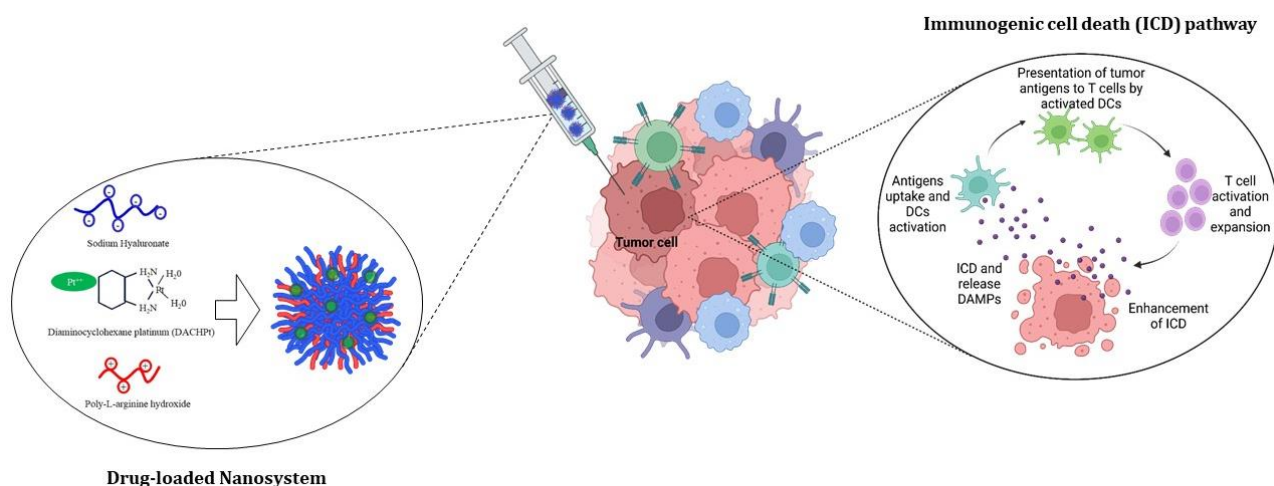


Figure 1: Drug-loaded nanosystem, as a tool to induce ICD in GBM.