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Development of post-surgical local delivery systems based on polymeric nanofibers for the administration of antineoplastic drugs against glioblastoma

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DISEÑO Y VALIDACIÓN DE NANOBIOMATERIALES DVN

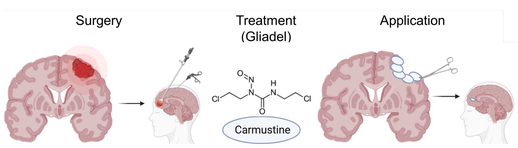
INTRODUCTION

Glioblastoma is an aggressive glioma with low incidence but high mortality, mainly due to its localization and the limited efficacy of current treatments (1). To overcome significant off-target toxicity due to systemic chemotherapy, localized delivery systems with controlled release, such as polymeric carmustine (BCNU) wafers under the name Gliadel®, are being explored (2). Encapsulating chemotherapeutics such as Doxorubicin (DOX) in polymeric nanofibers could offer a promising approach to enhance bioavailability and enable sustained, site-specific delivery.

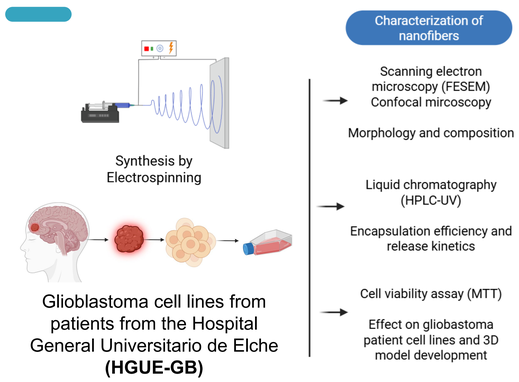
AIM

In this work, poly(methyl vinyl ether-alt-maleic anhydride) (PMVEMA) monoethyl ester (Es) and acid (Ac) nanofibers were synthesized as delivery systems for carmustine (BCNU) and doxorubicin (DOX).

Post-surgical application of local release systems

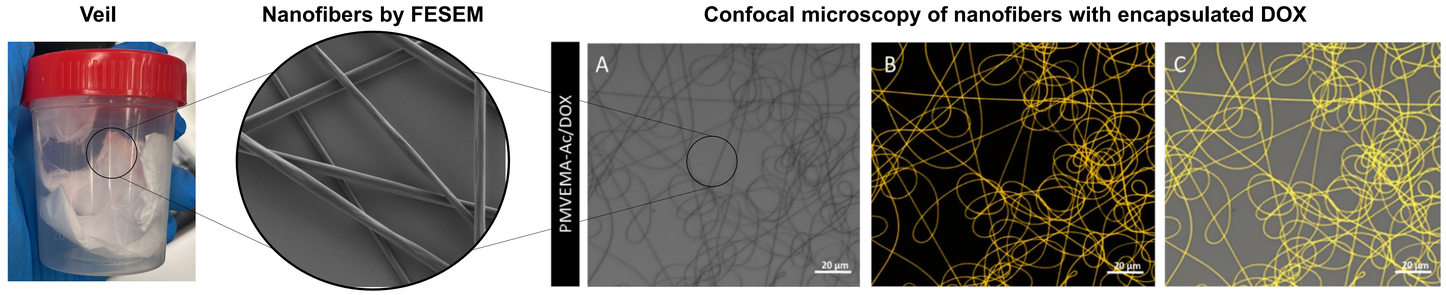


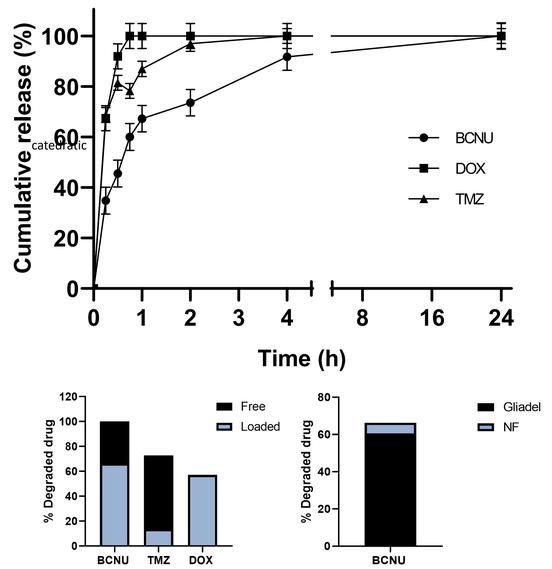
METHOD



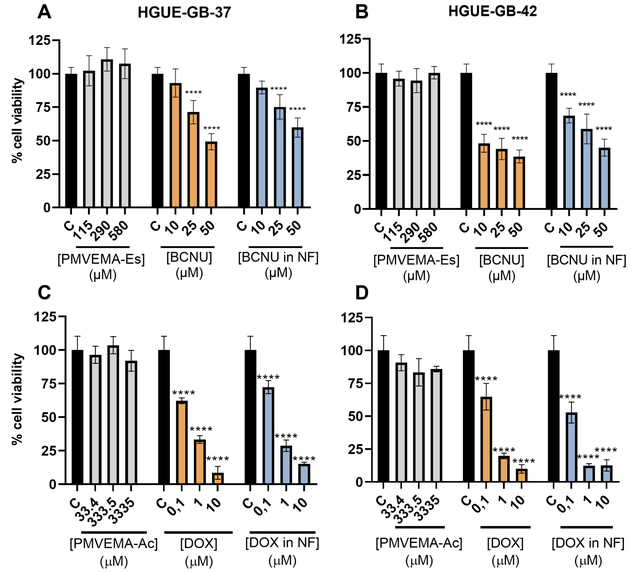
RESULTS

Characterization of BCNU and DOX nanofibers delivery systems

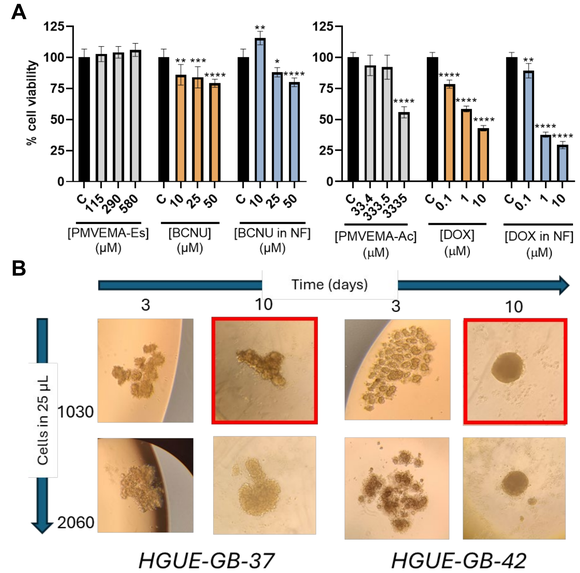




Cumulative release and degradation of BCNU, TMZ and DOX. The percentage of BCNU degradation encapsulated in NF and Gliadel® is shown. The assay conditions were 37º, at 24h and pH 7.4. (n=3)



Viability of HGUE-GB-37 (A y C) and HGUE-GB-42 (B y D) cells treated with different concentrations of nanofibers. Without drug (grey), free drug (orange) and encapsulated drug (blue) at 72 h post-treatment. Percentage relative to untreated control (****p < 0.0001). n=6 (mean ± SD).



Viability of Human Astrocytes (HA) cell line treated with different concentrations of nanofibers and development of glioblastoma spheroids. (A) Percentage relative to untreated control (****p < 0.0001). n=6 (mean ± SD). **(B)** Assay performed on drop (n=5).

CONCLUSIONS

Electrospun PMVEMA nanofibers enable efficient encapsulation of doxorubicin and carmustine being comparable to clinically approved versions. The loaded drugs keep their antitumor activity and reduces glioblastoma cell viability. These systems show potential as localized, controlled-release platforms for glioblastoma treatment

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