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Advanced hybrid theranostic nanoplatforms for an active drug delivery in the cancer treatment

GRAPHENE OXIDE NANOPLATFORMS TO ENHANCE PT-BASED DRUG DELIVERY IN OSTEOSARCOMA ANTICANCER THERAPY

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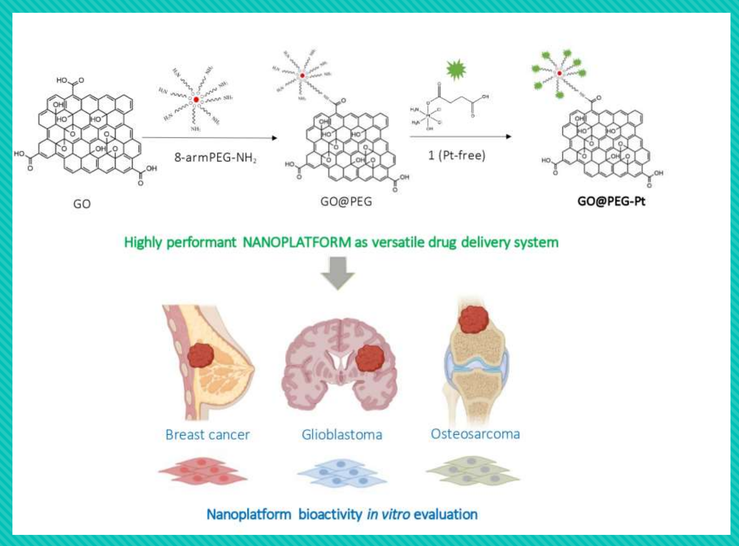
INTRODUCTION

Osteosarcoma is the most common type of bone cancer diagnosed especially in children and young adults[1].
Commonly used chemotherapy targets the high cancer cell proliferation metabolism using Platinum-based drugs that binds nuclear DNA causing its damage leading to apoptosis[2,3]. Despite Pt chemotherapeutics are the most potent used anticancer drugs, their side effects remain great drawbacks[4].

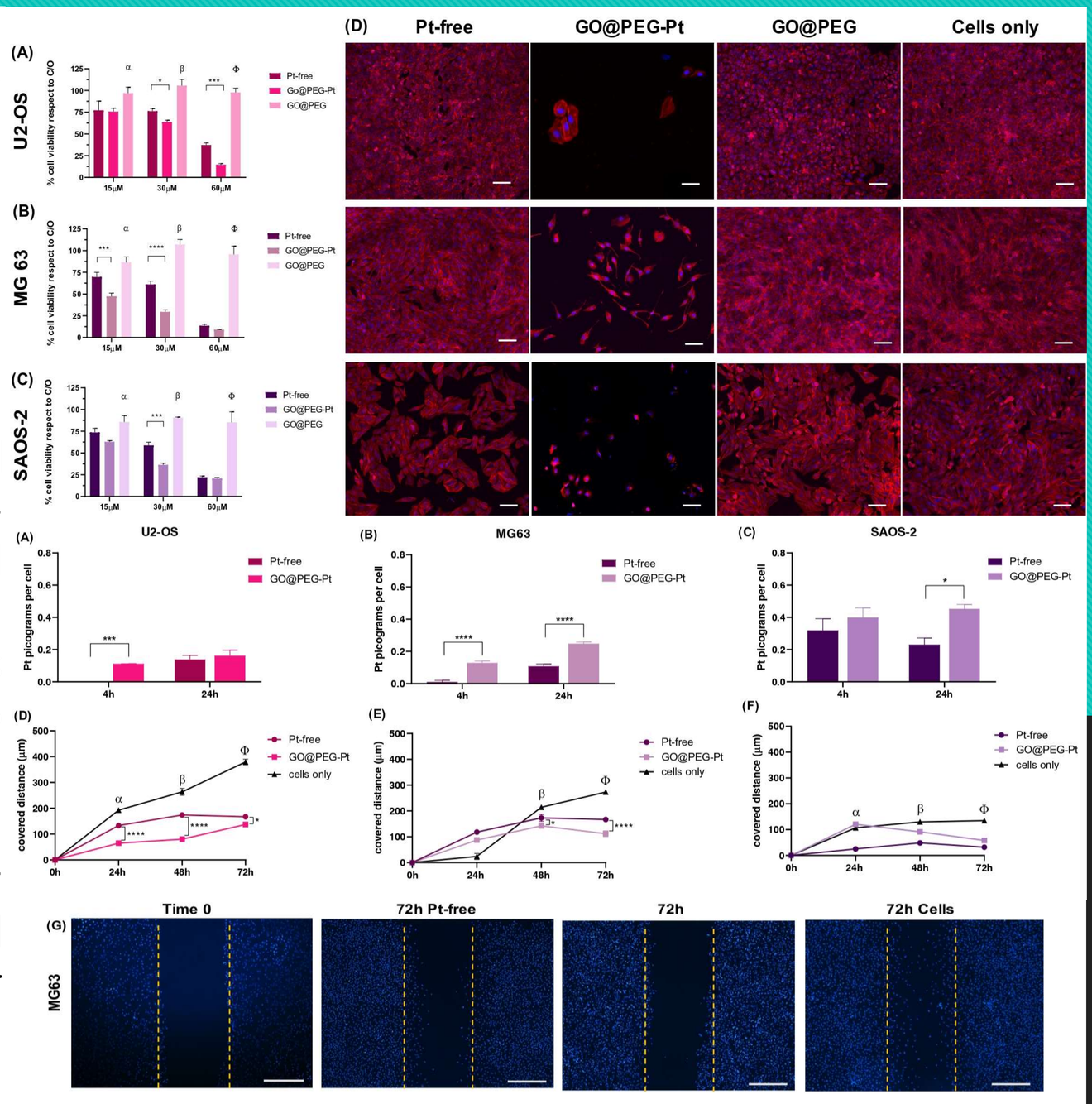


MATERIALS AND METHODS

Graphene oxide (GO)-based nanoplatforms as smart delivery systems of Platinum-based drug were synthesized. 8-arm polyethylene glycol-amine (PEG) was used to reduce GO cytotoxicity in health cells and promote its cellular uptake in cancer cells. GO-PEG-Pt platforms were compared *in vitro* to Pt-free (15μM, 30μM, and 60μM) on MG63, U2 and SAOS-2 osteosarcoma cell lines by cellular uptake (ICP-OES), viability (MTT assay), morphology (actin and DAPI staining) and migration (scratch test) evaluation.

RESULTS ANS DISCUSSION

GO-PEG was not toxic for cells at any concentration tested.
A significant cell viability reduction was detected at 30 μM GO-PEG-Pt for all cell lines compared to Pt-free, reaching 70% cell mortality in MG63 (p value ≤ 0.0001) and SAOS-2 (p value ≤ 0.001).
Morphological analysis showed cell number reduction in the presence of GO-PEG-Pt respect to Pt-free (30 μM is reported for each cell line).
Cellular uptake of GO-PEG-Pt was significantly higher after 24h for SAOS (p value ≤ 0.05) and MG63 (p value ≤ 0.0001) cell lines than Pt-free.
The cell migration was lower in Go-PEG-Pt than Pt-free in MG63 and U2 with overall more than 60% migration inhibition over time at 30 μM concentration, as confirmed by DAPI staining panel.



CONCLUSIONS

The results confirmed that GO-PEG-Pt platforms work as promising anticancer delivery systems. All the three osteosarcoma cell lines showed higher susceptibility to GO-PEG-Pt in terms of lower metabolic activity and lower migration rates due to the higher GO-PEG-Pt uptake compared to Pt-free.

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