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Cell membrane camouflaged nanoparticles for targeted glioblastoma therapy

**Wednesday, 14th May**
12.00 p.m.

CIC biomaGUNE - Seminar Room

Research efforts in the field of Neuroscience are driven by the need for new therapies to treat central nervous system disorders, such as Glioblastoma (GBM), the most common malignancy among glial cancers.

In recent decades, more and more interdisciplinary studies on biomaterials and novel technologies have emerged. In particular, the application of nanotechnology to medicine has opened up new treatment options since nanoparticles (NPs) can transport high doses of drugs and can be functionalized to target the tumor specifically.

However, there is a large gap between basic research and real applications, as few discoveries are translated into new technologies or medicines. One of the main reasons for the failure of the transfer of nanomaterials to the clinic is that NPs fail to adequately overcome biological barriers, which leads to a low accumulation of the drug in the tumor, as well as a nonspecific distribution.

When NPs are administered intravenously, opsonin adsorption can cause sequestration of nanosystems by cells of the mononuclear phagocytic system, resulting in low accumulation in the tumor. In the case of GBM, in addition to reach the target tumor, the NPs must cross the blood-brain barrier (BBB). To prolong systemic circulation and increase the tumor targeting, a new type of biomimetic nanosystem (cell membrane-camouflage NPs) has recently gained attention. Several sources of cell membranes have been explored to coat the surface of NPs, although the efficacy of the neural cell membrane coatings has been poorly investigated.

In this study, we explored the potential of cell membrane-coated NPs (CM-NPS) as a strategy to improve GBM targeting. We optimized the CM isolation protocol and extensively characterized the CM-NPs, demonstrating excellent colloidal stability in biological conditions. Flow cytometry revealed enhanced uptake compared to non-coated NPs. Additionally, the coating not only did not impede the physiological passage of NPs across the human in vitro BBB but, interestingly, increased the BBB permeability to NPs. These findings highlight that biomimetic coating of NPs with GBM cells is a potential strategy to create platforms for targeted chemotherapy of GBM.