Catalytic Nanomedicine: Particle size and support acidity effect in nanostructured biocatalysts to reduce brain glioblastoma multiforme tumors: Clinic Step.

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Glioblastoma multiforme (GBM) is by far the most common and most malignant of the glial tumors. It is composed of a heterogeneous mixture of poorly differentiated neoplastic astrocytes. These tumors may develop from lower-grade astrocytomas (World Health Organization [WHO] grade II) or anaplastic astrocytomas (WHO grade III). The treatment of glioblastomas is palliative and includes surgery, radiotherapy, chemotherapy and recently gliadel® local PLGA implants with carmustine. The kind of chemotherapeutics use in these patients is alkylating agents like temozolamide or cis-platinum based drugs, due to their relative efficacy against GBM. However, blood brain barrier (BBB) is the main obstacle to reach damaged areas. In our laboratory has been developed a neurological nanostructured biocatalyst using 1% of H_2PtCl_6•6 H_2O supported on a solid acid and brain tissue biocompatible sol-gel titania or silica. The results show nanostructured solids with elevated quantity of Lewis sites and the presence of the 1450 cm^{-1} characteristic Brönsted sites. A C_6 glioma model in Wistar rats was used. These solid materials are effective for the reduction of tumors. A strong dependence of platinum particle size and dispersion, as well, support hydroxylation and functionalization grade in the reduction of the tumor was observed. The acid sites of nanostructured biomaterial will be coordinated to C-N basic sites in DNA. Subsequently, the platinum cross-links two bases via displacement of the chloride ligand. Dispersed H_2PtCl_6 link DNA in several different ways, interfering with cell division by mitosis. The damaged DNA elicits was bonded to the octahedral metal ligands, which in turn activate cell apoptosis.