Smart Nanoparticles for the Treatment of Cancer.

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Nanomaterials are having a significant impact in biomedical applications since they can overcome some limitations of traditional approaches for the detection and treatment of diseases [1].

Notably, the treatment of diseases using nanocarriers has led to a significant reduction of toxicity and an increased efficacy due to the EPR effect [2]. This has been the case for Doxil and Abraxane. However, despite these improvements, further developments are desirable to tackle such diseases with precision nanomedicines. For instance, it is desirable that the therapeutics transported by the nanostructures remain inactive till the target area is reached. In this sense, we are exploring different nanomaterials as carriers of a variety of therapeutic molecules, which are covalently bound to the nanoparticle [3, 4]. This approach has allowed us to include multiple active molecules in a given nanostructure, which are released under different internal stimuli, such as low pH or high concentration of reductive molecules (Figure 1).

The diseases we are investigating include breast and pancreatic cancer and Uveal Melanoma and the nanostructures employed are mainly in our preparations are: gold, iron oxide, and albumin-based nanoparticles.

In the case of gold nanoparticles, we are studying the effect of nucleic acids (aptamers and antisense) and chemotherapeutics in Uveal Melanoma (UM). Currently, there is not an effective treatment of metastatic UM and it is usually detected when the disease has reached other organs, mainly the liver. At this point, the patients usually die in few months (6-18 months) [5].

In addition to gold nanoparticles, we are exploring albumin-based nanostructures for the treatment of UM and other cancers. These nanostructures are very promising due to their excellent stability and lack of toxicity.

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Figures

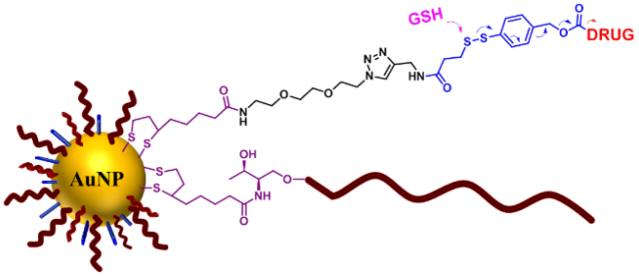

Figure 1. Drug release promoted by the presence of glutathione (GSH)