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## Hollow polymeric nanoparticles to enhance drug chemotherapeutic efficacy

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Paclitaxel (PTX), one of the most effective drugs for the treatment of breast and lung cancer, is limited by its severe side effects and low tumor selectivity. We carried out pH responsive hollow-poly (4-vinylpyridine) (hollow-p4VP) and Au (Au@p4VP) Nanoparticles (NPs) that have been used to generate PTX@p4VP NPs, employing a technique in which a gold core in the center of the NP is further oxidized to produce the hollow structure into which PTX molecules can be incorporated. The hollow-p4VP NPs exhibit good physicochemical properties and displayed excellent biocompatibility when tested on blood (no hemolysis) and cell cultures (no cytotoxicity). Moreover, mean diameter, ranging from 150 to 57 nm, can be accurately controlled upon varying the monomer concentration at synthesis. Interestingly, PTX@p4VP NPs significantly increased PTX cytotoxicity in human lung (A-549) and breast (MCF-7) cancer cells with a significant reduction of PTX IC50 (from 5.9 to 3.6 nM in A-549 and from 13.75 to 4.71 nM in MCF-7). In addition, PTX@p4VP caused a decrease in volume of A-549 and MCF-7 Multicellular Tumor Spheroids (MTS), an in vitro system that mimics in vivo tumors, in comparison to free PTX. This increased anti-tumoral activity is accompanied by efficient cell internalization and increased apoptosis, especially in lung cancer MTS. Our results offer the first evidence that hollow-p4VP NPs can improve the anti-tumoral activity of PTX. This system can be used as a new nano-platform to overcome the limitations of current breast and lung cancer treatments. The good results obtained for PTX allowed us to extend the use the colloidal hybrid system to Doxorubicin (Dox) and 5-Fluorouracil (5Fu). Here we present a complete characterization of PTX@p4VP NPs together with our preliminary results for these two anticancer drugs included into hollow polymeric systems.

## **Biography**

J M López Romero is a Professor of Organic Chemistry at the University of Málaga, Spain. He has carried out his Postdoctoral studies at the University Pierre et Marie Curie (Dr. Max Malacria, Paris VI, France) and University of Houston (Dr. Chengzhi Cai, USA). He is the Founder and Director of Icon Nanotech S.L., a Spanish Spin-Off company dedicated to nanotechnology and natural products. He has published more than 60 papers in reputed journals. His research interest includes synthesis of natural products, macromolecules and nanoparticles, all of them with applications in nanomedicine, cosmetics and in surface nanostructuration.

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