The use of nanostructures to deliver cisplatin and its prodrugs: from synthesis to biological applications.

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Chemotherapy conventionally involves the use of synthetic molecules and natural products that in general are low molecular weight anticancer compounds. Such agents inherently suffer from sub-optimal utilization due to rapid clearance and short blood circulation half-lives. In the case of cisplatin, one of these limitations is its low penetration into cells as well as the development of the so called resistance, a multifactorial event that decreases significantly the intracellular cisplatin concentration. To circumvent these limitations, recent studies are focused on the use of nanocarriers that permit, among others, to achieve higher drug uptake and controlled drug delivery. The nanoscale size of these carriers is important, since it prevents their extravasation in normal tissues and removal by renal clearance. As a result, they should have greater exposure to the tumor sites compared to low molecular drugs, which are rapidly cleared from circulation.

In this presentation two different nanocarriers are evaluated for the delivery of cisplatin and analogues. First, the use of human ferritin as nanocage for cisplatin incorporation is explored using different analytical strategies. First, the encapsulation of cisplatin as well as the drug functionality after cellular internalization (e.g. DNA interaction capabilities, cytotoxicity, etc.) are evaluated.¹ The second possibility refers to the use of ultra-small iron oxide nanoparticles as vehicles for transportation of cisplatin analogues (cisplatin (IV) prodrugs) in which the synthesis and further cellular uptake are explored using multiple analytical tools.