From Coordination Chemistry to Drug Delivery

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Coordination chemistry forms a toy box full of powerful tools that can be employed in technological and medicinal areas of modern society. When scoping the past two decades of research in anticancer metallodrugs, it is more than clear that platinum and ruthenium hold an exceptional position among other d-block metals. Although the 'traditional' molecular approach toward novel anticancer metallodrug development is yet not overcome, the progress is often enhanced by exploiting supramolecular chemistry and nanochemistry. In supramolecular chemistry, it is the interaction with various (bio)polymers (e.g, polylactic acid, albumin) or small carrier molecules such as macrocycles like β-cyclodextrin or cucurbituril. The supramolecular assembly strategy shows promising results for mono- and poly-nuclear complexes of platinum and ruthenium enhancing their anticancer activity and other properties. The assembly formation is achieved through non-covalent interactions between the macrocycle and metal complex moiety, often addressed as a binding anchor (e.g., adamantane). On the other hand, using nanomaterials, nanoparticles (NPs), in particular, features fine distribution and availability of the metallodrug attached covalently to the NPs along with a possibility for magnetic concentration if magnetic NPs are employed. Our past efforts focused on the preparation of Ru[1] and Pt[2] metallodrugs with various ligands suitable for binding to cucurbituril and β-cyclodextrin. The complexes were characterized and their solution behavior was investigated by multinuclear NMR spectroscopy and other methods. The bioevaluation in vitro showed promising results in metallodrug uptake, cytotoxicity, and antimetastatic effects for the supramolecular assemblies studied.

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