Anionic Metallo-Carbenes : synthesis, study and vectorization for antitumor control

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N-Heterocyclic carbene as ligand for organometallic chemistry is a relatively young area that offers new opportunities in many fields including bio-inorganic chemistry.[1] These ligands fit the prerequisites for metal drug development and recent achievements have demonstrated the great potential of these compounds.

The properties of these metal NHC complexes also allow for easy post-functionalization, thus enabling molecular diversity for efficient drug design. Overall, N-heterocyclic carbene ligands have revealed new opportunities for metal drug development and the rapid successes of these complexes derive from the richness of N-heterocyclic carbene metal chemistry and the favorable biocompatibility of these complexes.[2]

Although many studies have been done on this subject, preclinical and clinical developments for such new molecules still faces multiple challenges that can be addressed in part by chemical science research. In particular, a major barrier for organometallic compounds remains their poor water solubility (and stability), so that organic solvents are still needed to ensure biological activity. Cellular uptake in an efficient and selective manner towards cancer cells is also a very important parameter to improve.

The current project proposes to deal with these different problems by using a new strategy. It would consist in designing negatively charged carbene[3] complexes allowing a well-established delivery mode, commonly used in gene transfer. These new compounds could be vectorized by complexation via electrostatic interactions with cationic vectors which are used in the field of gene transfer. The project is therefore interdisciplinary, tackling problems at the interface of organic, inorganic and organometallic chemistry in strong collaboration with a group of biologists.

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[2] Bellemin-Laponnaz, S.; *Eur. J. Inorg. Chem.* **2020**, 10-20.
[3] Nasr, A. ; Winkler, A. ; Tamm, M. *Coord. Chem. Rev.* **2016**, *316*, 68-124.