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Metal complexes in biology: development of metal-based probes

Inorganic complexes are increasingly used for biological applications, as metallodrugs or metalloprobes. At the Laboratoire des Biomolécules, we develop biologically active metal complexes and metal-based probes and their studies in a biological context. Innovative techniques to investigate their speciation, quantify them and determine their cellular location are used, leading to key information about their behavior inside cells. I will illustrate our approach with a focus on two recent projects:

(1) Nanometer-scale distance measurements by pulse electron paramagnetic resonance (EPR) techniques are powerful biophysical tools to study the structure, dynamics and functions of biomolecules and biological systems. A commonly used approach is to measure the magnetic dipolar interactions between two nitroxides spin labels, introduced on the biomolecule by site-directed spin labelling, using pulse electron double resonance (PELDOR). Over the last decade, high-spin metal centers (GdIII (S = 7/2) in particular) have been introduced as alternative paramagnetic centers for PELDOR measurements. Despite MnII (S = 5/2) being very attractive for biological applications, MnII-based pulse-EPR distance measurements have been less explored. We have developed synthetic model compounds incorporating two MnII spin-labels for the development of MnII-MnII PELDOR.

(2) Metal-CO complexes can be designed as multimodal probes, combining fluorescence, IR-modality, but also, as shown very recently, X-fluorescence properties. Rel(CO)3X complexes (with L a ligand with low-lying π*-orbitals) display a single molecular core enabling multimodal imaging, both at the sub-cellular and tissue levels. One of the interests of the IR modality is the possibility of direct quantification in a biological context. X-fluorescence offers direct imaging of the metal center and is a promising powerful technique in the study of metal complexes in biological environments. Development of new Rel(CO)3X probes and their study in multimodal bio-imaging will be presented.

References:

Date: 10th January 2018 (Wednesday)  
Time: 10:30am – 12:00pm  
Venue: SPMS Research & Graduate Studies Office Conference Room  
Host: Assoc Professor Leong Weng Kee

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