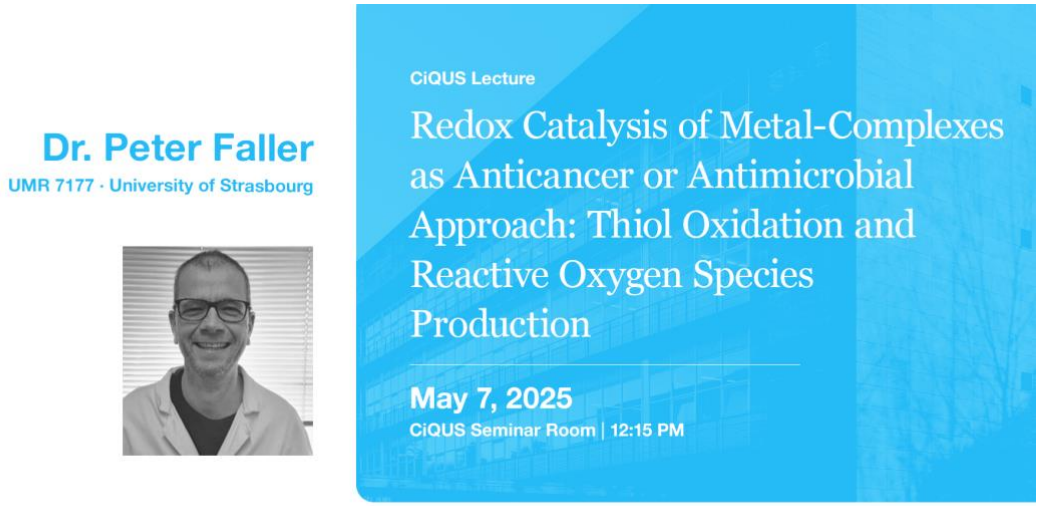

Dr. Peter Faller

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Abstract

Redox reaction are very fundamental for biology as electron transfer is the basis of energy conversion for life. A canonical example is the respiratory chain in the mitochondria. In biology this electron transfer between the donors and acceptors follows specific paths and has to be tightly controlled, to avoid potential dangerous off-pathway electron transfer. Redox active metal ions are very suited for electron transfer reactions, and Nature uses different redox active metal ions, such as copper, iron, manganese etc. Moreover, the activity of these metal ions are controlled by the way there are bound, i.e. by their ligands. Due to this reason to control the chemistry redox active metal ions are always bound to biomolecules, principally proteins.

Several diseases have been linked to a mismetabolism of metal ions. For instance, Wilson's and Menkes diseases are genetic copper disorders and lethal if not treated. They lead to an overload or to a lack of copper, respectively. Also Alzheimer's disease and cancer have been related to copper.

Our group is interested in redox active metal ions, mainly the essential copper, but also iron. We aim on one side to understand their role in biology including the diseases mentioned above and try to design and/or use ligands to interfere with their metabolism for a therapeutic approach.

During the last years we worked on the metal-ligand complexes, mainly with Cu, used in anticancer and antimicrobial activity. However, it was realized that stability of these Cu-L are a major and often underestimated issue. Recent advancements and mechanistic insights towards stable and active Cu-L will be presented. Particular focus is on understanding the redox chemistry of Cu-L with cellular thiols (glutathione, cysteine, thioredoxin, metallothionein) or other reducing agents to produce reactive oxygen species (ROS). Both ROS production and thiol depletion are considered as therapeutic strategy in cancer.

Biosketch

Peter Faller is Professor in Chemistry at the University of Strasbourg (France) and Group Leader at the Institute of Chemistry. He studied at the University of Zürich (Switzerland) earning a PhD in biochemistry on metallothioneins in 1998 with Prof. M. Vasak. He did his postdoctoral studies on photosystem II at the CEA near Paris (France) with Dr. Bill Rutherford and in Freiburg (Germany) with Dr. Anja Krieger-Liszkay. In 2003 he was appointed professor and group leader at the LCC (Coordination Chemistry Laboratory of the CNRS) in Toulouse (France), where he stayed more than a decade, mainly working in bioinorganics on the role of essential d-block metal ions in the aggregation and toxicity of the peptide amyloid-beta linked to Alzheimer's disease. In 2015 he moved to the Chemistry Institute at the University Strasbourg.

Ongoing research projects of his group in bioinorganics on the development of copper(II) sensors for detection in biological media, mechanistic studies of chelators complexed with copper or iron in their anticancer and antimicrobial activity, reactivity of copper-amyloidogenic peptides, and the development of hybrids of peptides and metal-complexes for therapeutic approaches.