**UE 3.5C – Bio-inorganic chemistry – 6 ECTS**

**Instructors' names:**
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**Pedagogical objectives:**
Know and understand the role of metal ions in biology using basic principles of coordination chemistry, redox chemistry and biological chemistry: Structure, mechanism and reactivity of major classes of metallo-enzymes, activation of small molecules (H2O, O2, NO). Biological role, inhibition, pharmacological consequences. Design and study of model systems. Biomimetic chemistry, bio-inspired chemistry.

**Course pre-requisites:**
Bases of chemistry of coordination and enzymology. Notions of redox chemistry

**Program:**
**Panorama:** -Role of metals in biology, presentation of the field of bio-inorganic chemistry; -Bases of the coordination chemistry of transition metals in biological environment; -Transfer of electrons in biology; -Use of dioxygen by aerobic organisms; -Diversity of enzymes involved in aerobic life; -Implications in pharmacology and toxicology.

**Hemoproteins (D. Mansuy, J.-P. Mahy)**
-Modulation and control of the reactivity of the heme by the protein: transfer of electrons, activation of O2 (P-450, cyclooxygenase) and H2O2 (peroxidases, catalase)
-Rational design of biomimetic systems, models, oxidation catalysts

**Copper proteins (O. Reinaud)**
-Types 1 and A: electron transfer
-Type 2: non-coupled mono-oxygenases, superoxide dismutase
-Type 3: from the transport of O2 to the activation of O2 (tyrosinase, catecholase)
-Centre of reduction of O2 by 4 electrons: ceruloplasmin, cytochrome c oxidase
-Model systems

**The enzymes with non-heme iron (F. Banse)**
- (Bio) chemistry of iron oxo

**(Bio) chemistry of vitamin B12 and derivatives (cobalt) (D. Padovani)**

**Acquired skills:**
Knowledge and understanding of the major classes of metallo-enzymes should enable the student to (i) reason in a transversal way, ie to make a connection between his knowledge in chemistry and enzymology, (ii) to understand the importance and meaning Redox reactions in metabolism, signaling and protection, (iii) predicting the transformation reactions of xenobiotics, (iv) understanding the mechanism of action of inhibitors specifically targeting an enzyme and therefore being able to imagine New, (iv) discover bio-inspired chemistry and its potential developments. The discovery of the molecular mechanisms of metallo-enzymes then becomes a source of inspiration and creation for the chemist.

**Evaluation:**
Terminal exam (100 %)