

Master in Chemistry

Sujet de stage de Master 2 (1 page max.)

Laboratoire : Institut de Biologie Structurale (IBS)

Directeur : W. Weissenhorn

Intitulé de l'équipe : Métalloprotéines

Responsable : Y. Nicolet

Nom et Qualité du Responsable du Stage : M. Cherrier

HDR oui non

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Parcours de Master 2 (*Rayer la/les mention(s) inutile(s)*) :

Chemistry for Life Sciences (CLS)

Polymers for Advanced Technologies (PTA)

Organic Synthesis (SOIPA)

Titre du sujet : Structural study of the metal cluster maturation of Nitrogenase

Objectifs visés du stage (5 lignes max) :

The goal of this M2 proposal is to study the macromolecular machinery responsible for the biosynthesis of the nitrogenase active site. Combining different structural biology techniques, we will focus on the successive catalytic steps in the assembly of the FeMo-co as well as on its transfer between partner proteins.

Intérêts pédagogiques et compétences visées (5 lignes max) :

The student will be trained in the different techniques dedicated to the study of metalloproteins sensitive to oxygen and will work using anaerobic chambers. He will also be able to use various structural biology techniques and will be able to learn how to deal with X-ray diffraction data and cryo-electron microscopy.

Résumé :

Nitrogen is one of the main components of proteins and nucleic acids, but the majority of living organisms are unable to use the most abundant source of nitrogen: the atmospheric dinitrogen. Only few microorganisms, named diazotrophs, are able to catalyze the difficult reaction of dinitrogen reduction into ammonia under ambient conditions. An enzymatic complex called nitrogenase, which contains one of the most complex metal clusters, is responsible for this conversion. In addition to its fundamental interest, the study of nitrogenase also aims at bioengineering plants to make them capable of using atmospheric nitrogen instead of supplying nitrates, which are responsible for water and soil contamination. In addition, nitrogenase can be used for hydrogen or hydrocarbon production. The M2 student will be involved in the structural study of the proteins complexes catalyzing the biosynthesis of the nitrogenase active site. Because the metalloclusters are sensitive to oxygen-induced damage, these systems have to be studied under a strict anaerobic environment.

Approches & matériels utilisés (5 lignes max) :

The studied protein complexes will be expressed, purified and characterized using classical biochemical techniques. Samples will be prepared in anaerobic environment inside our glove boxes. X-ray crystallography, and when possible cryo-electron microscopy techniques will be used as main techniques. Most of the experiments will be performed using the different gloveboxes available in the laboratory to express, purify, crystallize proteins and freeze cryo-EM grids

Domaines de compétences souhaitées du candidat (3 lignes max):

Biochemistry ; Structural Biology ; Bioinformatic ; bioinorganic chemistry knowledge would be a plus

Dates du stage : Janvier – Juin 2021