Deciphering protein oxidation during biomass degradation by filamentous fungi using chemoproteomic approaches

Keywords: **biotechnology, chemical probes, fungi, plant biomass, protein oxidation**

Summary

Plant biomass is essentially constituted by the cell walls which are heterologous mixtures of polysaccharides, polyaromatic lignin and lipid-derived polymers. Filamentous fungi are the main degraders of these polymers, which they use as nutrients source. They secrete a wide variety of enzymes and other proteins into the extracellular environment to deconstruct the diverse biomass components. This lignocellulosic biomass and the fungal enzymes constitute invaluable resources for the biotechnological production of chemicals and energy as alternative to fossil reserves. The BBF and ISM2 teams' goals are to understand the fungal enzymes functioning for acquisition of basic knowledges and potential applications in green chemistry[1,2]. Biomass degradation is concomitant with a great production of oxidant molecules, such as hydrogen peroxide (H_2O_2) and highly reactive phenolic radicals. These molecules can oxidize proteins on sensitive residues like methionine and tyrosine, leading to 'redox post translational modifications (PTM)', the consequences of which range from damaging effects to fine-tuned regulation of protein functions and fates. Although these roles are well-established in bacteria and animals, the knowledge about redox PTM in fungi, and particularly for secreted enzymes during biomass degradation, is extremely scarce. The project aims to identify fungal proteins which are oxidized during biomass degradation and to evaluate the effect of their oxidation on their functions and activities. The objective will be the synthesis of chemical probes targeting methionine or tyrosine sensible to oxidation for their use in proteomics approaches[3,4]. The effects of oxidations will be evaluated *in vitro* on purified recombinant proteins using various biochemical and biophysical assays, and *in vivo* using the genetically modifiable *Podospora anserina* fungi as model organism. The potential findings are expected to lead to biotechnological applications.

References: 1. Couturier M *et al*. Nat. Chem. Biol. 14, 306–310 (2018); 2. Lazarides T *et al*. J. Am. Chem. Soc. 135, 3095–3103 (2013); 3. Tarrago L *et al*. Biochem. J. 475, 3779–3795 (2018); 4. Lin S *et al*. Science 355, 597–602 (2017).

The co-supervisors

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Location

BBF, Luminy Campus, Marseille, France
iSm2, Saint-Jérôme Campus, Marseille, France

Doctoral school

Chemical Sciences (ED 250), Aix-Marseille université

Expected profile of the candidate

We are seeking for highly motivated candidates (master level or equivalent with honors) with solid training in molecular chemistry and/or biological chemistry (chemistry/biology interface). Experiences in biochemistry, and/or proteomics data analysis would be an asset. Good English level is mandatory.