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RESEARCH INTERESTS

- Ubiquinone biosynthesis
- UbiU-UbiV, hydroxylase enzymes with [4Fe-4S] clusters
- prephenate-dependent anaerobic hydroxylation
- biochemical and mechanistic study of UbiU-UbiV
- synthesis of UbiU-UbiV substrates analogues

SUMMARY

Ubiquinone is a small lipophilic molecule involved in electron transfer in the aerobic respiratory chain of all living organisms. Its aerobic biosynthesis involves a large number of proteins, around a dozen in *Escherichia coli*, seven of which form a stable multi-protein complex known as the Ubi metabolon. Very recently, it was discovered that this biosynthesis also takes place in the absence of oxygen and that this anaerobic biosynthesis involves proteins with [4Fe-4S] clusters whose role is still poorly understood. These proteins, known as UbiU and UbiV, form a heterodimeric protein complex and are involved in the hydroxylation reactions on the aromatic ring of the quinone. The oxygen atom donor would be the prephenate.

The discovery of a new oxygen atom donor raises mechanistic questions about the mode of activation of prephenate as well as the role of the [4Fe-4S] clusters found in UbiU/UbiV.

Thus, we aim at studying the newly discovered O₂-independent ubiquinone biosynthetic pathway which will allow us to unveil an unprecedented mechanism of anaerobic insertion of an O atom into a -CH bond, in a prephenate-dependent manner and that would be catalyzed by a new family of enzymes, [4Fe-4S] hydroxylases.

We will decipher at the molecular level the hydroxylation mechanism of these two newly identified [4Fe-4S] proteins, UbiU and UbiV. The obtained mechanistic knowledge will be used to develop potential selective inhibitors of this anaerobic UQ biosynthetic pathway in pathogenic bacteria, using *Pseudomonas aeruginosa* as a model.

EDUCATIONAL BACKGROUND

2021-2022 : Master's degree (2nd year) in molecular chemistry, Sorbonne Université

2021-2022 : Master's degree (1st year) in biological chemistry, major in organic chemistry, Université Paris Saclay

2019-2021 : Bachelor's degree in biological chemistry, major in chemistry, Université Paris Cité

PREVIOUS RESEARCH ACTIVITIES

2023 : Second year master internship at Collège de France (Laboratoire de Chimie des Processus Biologiques) in Paris

Study of the role of prephenate in the anaerobic biosynthesis of ubiquinone in *E.coli*,
Synthesis of a stable and labelled precursor of prephenate

2022 : First year master internship at INSERM (UMRS_1134 Biologie Intégrée du Globule Rouge) in Paris

Development of the detection of erythrocyte alpha synuclein, validation of the BioID tool to identify the protein partners of two erythroid proteins (Stomatin and Semaphorin 7A)

2021 : Bachelor internship at ITODYS in Paris

Synthesis of iron oxide and carbon nanoparticles, functionalisation of nanoparticles with chelators and characterization, adsorption tests in the presence of various metals (Pb, As, Cr, U, Cs, K, etc.)