UFR de Chimie et de Biologie
UNIVERSITÉ Grenoble Alpes

Master's degree in Biology – Chemistry-Biology Department

Master 2 internship project
Year 2019-2020

Laboratory/Institute: IBS
Director: W. Weissenhorn
Team: Biomolecular NMR spectroscopy
Head of the team: P. Schanda

Name and status of the scientist in charge of the project: B. Bersch **HDR: yes x no ☐**
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Program of the Master's degree in Biology:

☐ Immunology, Microbiology, Infectious Diseases x Integrative Structural Biology
☐ Physiology, Epigenetics, Differentiation, Cancer ☐ Neurosciences and Neurobiology
☐ Planta International

Title of the project:

Molecular interaction between the mitochondrial outer membrane receptor Tom70 and its client proteins

Objectives (up to 3 lines):

Tom70 is a 70 kDa protein of the mitochondrial outer membrane. It is a receptor for mitochondrial protein import. Using NMR and other biophysical techniques we want to analyze the interactions between Tom70 and different client proteins in order to better understand its specificity and its role in protein import.

Abstract (up to 10 lines):

The vast majority of the more-than 1000 mitochondrial proteins are synthesized outside these organelles, in the cytosol, and must be imported via sophisticated machineries composed of chaperones, receptors, membrane translocases and insertases. While many of the components and mechanisms along this import pathway have been characterized on a biochemical level, little is known about the structural basis of their actions at the atomic level. Tom70, a protein of the outer mitochondrial membrane has a domain exposed to the cytosol which interacts with different unfolded client proteins. It is known that Tom70 acts as a receptor for preproteins that are further imported via two different pathways: most preproteins pass the outer membrane via the TOM40 pore on their way to their final destination. However, some proteins enter the outer membrane via the MIM system. We would like to decipher the specific interactions between TOM40 or MIM-related preproteins and the (soluble) cytoplasmic domain of Tom70.

Methods (up to 3 lines):

protein production and purification, isotopic labelling, specific labelling, NMR, SDS-PAGE, pull-down experiments

Up to 3 relevant publications of the team:

Structural Basis of Membrane Protein Chaperoning through the Mitochondrial Intermembrane Space.
Weinhäupl K, Lindau C, Hessel A, Wang Y, Schütze C, Jores T, Melchionda L, Schönfisch B, Kalbacher H, Bersch B, Rapaport D, Brennich M, Lindorff-Larsen K, Wiedemann N, **Schanda P**.
Cell. 2018 Nov 15;175(5):1365-1379.

How Detergent Impacts Membrane Proteins: Atomic-Level Views of Mitochondrial Carriers in

Dodecylphosphocholine.
Kurauskas V, Hessel A, Ma P, Lunetti P, Weinhäupl K, Imbert L, Brutscher B, King MS, Sounier R, Dolce V, Kunji ERS, Capobianco L, Chipot C, Dehez F, Bersch B, **Schanda P**.
J Phys Chem Lett. 2018

Structural investigation of a chaperonin in action reveals how nucleotide binding regulates the functional cycle.
Mas G, Guan JY, Crublet E, Debled EC, Moriscot C, Gans P, Schoehn G, Macek P, **Schanda P**, Boisbouvier J.
Sci Adv. 2018 Sep 19;4(9):eaau4196

Requested domains of expertise (up to 5 keywords): structural biology, bacterial cell cultures, protein purification on Ni-NTA