SCIENCES & BIOENGINEERING SCIENCES

The Research Group
Structural Biology Brussels

has the honor to invite you to the public defence of the PhD thesis of

Julia Malo Pueyo

to obtain the degree of Doctor of Bioengineering Sciences

Title of the PhD thesis:

Molecular insights into the structural organization and redox relay dynamics of human and yeast peroxiredoxins

Supervisor:
Prof. Dr. Joris Messens (VUB)

The defence will take place on
Monday, January 26, 2026 at 4 p.m.

VUB Etterbeek campus, Pleinlaan 2, Elsene, Promotiezaal D.2.01

The defence can be followed through a live stream: Public PhD Defence Julia Malo Pueyo | Meeting-Join | Microsoft Teams

Members of the jury

Prof. Dr. Ir. Wim Versées (VUB, chair)
Dr. Marcus Fislage (VUB)
Prof. Dr. Joske Ruytinx (VUB)
Prof. Dr. Elena Hidalgo (Universitat Pompeu Fabra, ES)
Prof. Dr. Tobias Dick (Heidelberg University, DE)

Curriculum vitae

In 2020, Julia obtained her MSc in Molecular Biology at VUB, KULeuven and UAntwerp. At the end of 2020, she began her PhD in the Redox Signaling Lab under the supervision of Prof. Dr. Joris Messens. In 2021, Julia was awarded an FWO Fellowship for Fundamental Research to support her doctoral project. She has published in eight peer-reviewed journals, from which one as joint first author, and currently has a manuscript under revision, also as joint first author. She participated in five international conferences and one international EMBO practical course. She organized a symposium, supervised one MSc thesis, and assisted in practical courses for MSc programs. Julia received a talk award at the GRS in 2024.

Abstract of the PhD research

Peroxiredoxins (Prdxs) are important enzymes that help maintain a balanced cellular environment by controlling oxidative stress and signaling. They do this by interacting with other proteins, altering their activity. This interaction process, known as redox relay, involves a temporary bond between Prdx and the target protein. In addition, different types of Prdxs can interact with each other, forming pairs or larger decameric heterocomplexes, which adds a layer of complexity to their function. Today, we still do not fully understand how Prdxs form these decameric heterocomplexes with different types of subunits, how they work together, or what molecular fractions drive these interactions. To answer these research questions, I developed improved methods to produce and purify Prdxs. I used a variety of techniques to study how these Prdxs interact and form complexes. These included methods like electron microscopy to visualize the complexes and mapping specific interactions between the proteins. The results showed that it is difficult to reassemble redox-relay complexes in the lab because these interactions are transient and dependent on oxidation. The study also found that incorporating just one subunit of one type of Prdx into a complex of subunits of another type can stabilize the decameric structure. This discovery provides insight into how these enzymes form and stabilize different structural configurations. By uncovering the principles behind their structural assembly and interaction dynamics, these findings offer valuable knowledge into how peroxiredoxins modulate cellular processes and respond to oxidative stress.