Departamento de Física de la Materia Condensada

Universidad Zaragoza

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King's College London

How do proteins interpret mechanical signals?
Single-molecule lessons from the talin mechanosensor

Mechanical stimuli regulate many biological functions, including cell migration, development, or differentiation. Despite recent critical advances in our understanding of mechanotransduction, how cells detect and interpret mechanical cues from a molecular perspective remains largely unknown. Here, I will present some of our latest work on talin, a critical force-sensing protein working in focal adhesions. Thanks to our newly developed magnetic tweezers setup, we directly measured the conformational dynamics of single talin proteins under mechanical conditions mimicking those in the cell. With this approach, we explored three facets underpinning the force-sensing function of the talin protein, namely: 1) its conformational dynamics under force over long timescales; 2) its ability to recruit ligands such as vinculin in a force-dependent way; 3) the role of cryptic post-translational modifications on its force-sensing properties.
Overall, in this seminar, I will illustrate how protein folding and protein chemistry couple together to establish biological mechanisms allowing cells to interact with their mechanical microenvironment.

Rafael Tapia-Rojo obtained his PhD in 2016 (Universidad de Zaragoza), working on the development of mesoscopic models to address different biological problems. He then joined Prof. Julio Fernandez's group at Columbia University (NYC), where he used and developed magnetic tweezers instrumentation to understand how mechanical forces regulate protein function. In 2021, he joined Prof. Garcia-Manyes' lab at King's College London. He now holds a King's Prize fellowship and is an appointed lecturer in Biological Physics, starting in 2023.

Con la colaboración de:

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