Internship Proposal

Proposal By: Ana Xavier de Carvalho | anacarvalho@i3s.up.pt

Proposal At: 2026-02-05

Contact: anacarvalho@i3s.up.pt

Project Title:
Actin regulation in a contractile organ in vivo

Level:

Master Student

Project Summary:

Contractile tubular organs, such as blood vessels, airways, and the uterus, are essential for life, and their malfunction underlies diseases like hypertension and asthma. Yet, how these organs acquire their shape and coordinated contractile behavior during development remains poorly understood.

This project tackles this fundamental question using the C. elegans spermatheca, a simple and genetically tractable contractile tube that functions during ovulation and embryo fertilization. Despite being composed of only 24 cells and a valve, the spermatheca displays highly coordinated contractions driven by a beautifully organized actomyosin cytoskeleton, making it an ideal in vivo system to dissect the principles of organ contractility. This project offers hands-on experience with state-of-the-art imaging and genetic tools while addressing a question with broad relevance to developmental biology, disease modeling, and tissue engineering. The insights gained will help reveal how molecular composition shapes tissue mechanics and how these principles might be harnessed to design synthetic or engineered contractile tissues.

Work to be developed by the student:

You will investigate how an actin regulator contributes to assemble the actomyosin networks that allow for the spermatheca to work. By combining live fluorescence imaging, CRISPR-based genome editing, and functional contraction assays, you will visualize how actin networks are remodeled in real time and how specific molecular components control the formation of force-generating actin bundles.

References:

Sobral AF, Chan FY, Norman MJ, et al. Plastin and spectrin cooperate to stabilize the

actomyosin cortex during cytokinesis. Curr Biol. 2021;31(24):5415-5428.e10. doi:10.1016/j.cub.2021.09.055

Silva AM, Chan FY, Norman MJ, et al. -heavy-spectrin stabilizes the constricting contractile ring during cytokinesis. J Cell Biol. 2023;222(1):e202202024. doi:10.1083/jcb.202202024

Santos IC, Silva AM, Gassmann R, Carvalho AX. Anillin and the microtubule bundler PRC1 maintain myosin in the contractile ring to ensure completion of cytokinesis. Development. 2023;150(12):dev201637. doi:10.1242/dev.201637

Chambaud GD, Martin VC, Hickson GRX. Anillin links up with RhoA to break the symmetry of cytokinetic ring closure. J Cell Biol. 2025;224(6):e202504164. doi:10.1083/jcb.202504164

INSTITUTO
DE INVESTIGAÇÃO
E INOVAÇÃO
EM SAÚDE
UNIVERSIDADE
DO PORTO

Rua Alfredo Allen, 208
4200-135 Porto
Portugal
+351 220 408 800
info@i3s.up.pt
www.i3s.up.pt