CURRÍCULUM VÍTAE NORMALIZADO

Germán Rivas Caballero

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GOBIERNO DE ESPAÑA
MINISTERIO DE CIENCIA E INNOVACIÓN

FECYT INNOVACIÓN

Resumen libre del currículum

Descripción breve de la trayectoria científica, los principales logros científico-técnicos obtenidos, los intereses y objetivos científico-técnicos a medio/largo plazo de la línea de investigación. Incluye también otros aspectos o peculiaridades importantes.

Germán Rivas: http://www.cib.csic.es/en/grupo.grivas
ORCID: 0000-0003-3450-7478Citations > 11000 (SCOPUS – last 5 years: > 5500)
Publications: 172 (Q1:139; D1:61) (SCOPUS). See Publication List
h index: 55 (SCOPUS)
12 doctoral thesis supervised

Executive Summary
1. Education
2. Professional experience
3. Scientific output – general quality indicators
4. Fields of expertise
5. Scientific achievements as senior investigator (ordered chronologically)
6. Funding
7. Prizes and Honors
8. Organization summer schools, advanced masters and international meetings
9. Scientific management and evaluation 10. Invited talks to international conferences
11. Scientific supervision
- Postdoctoral investigators
- Doctoral thesis
- Master Thesis
12. Teaching
13. Internationality - scientific projects and collaborations
- Management of international projects
- Scientific collaborations with researchers from other countries (only shown the ones currently active)
- International collaborations in the context of the CSIC-UIMP advanced training master programs
14. Innovation and transfer activities
15. Collaboration with industry and the private sector
16. Publication list

EXECUTIVE SUMMARY

I have devoted my scientific career to quantitatively studying multi-protein systems whose elements dynamically interact to organize functional cellular machines involved in essential processes. This general interest has led me to investigate first (during my thesis) the biochemical organization of the integrin aIIbb3 from platelet membranes. Then, as a postdoctoral, I contributed to developing experimental and theoretical methods to detect and measure reversible macromolecular self- and hetero-associations in solution and applied them to quantitatively characterize the assembly of the first complex of the complement system and integrin aIIbb3 - fibrinogen interactions in solution.

During my postdoctoral time in Minton's lab, I realized the impact of the local microenvironment (background interactions) on the functional energetics of macromolecular associations in physiological (crowded) environments. For these reasons, back in Madrid, we developed unique biophysical methods to study protein associations under crowding conditions similar to the natural cell interior, allowing us to experimentally demonstrate that excluded volume effects due to crowding can significantly affect the mode and extent of protein association.
The assembly of autonomous self-replicating artificial cells from molecular components that exhibit the essential characteristics of life is one of the grand contemporary scientific challenges. It requires interdisciplinary skillsets to design and integrate biochemical modules at different levels of hierarchy. For the last 25 years we aim at reconstituting minimal machinery for autonomous cell division, one of life's most stunning and central features. In this regard, our laboratory has explored the biochemical mechanisms governing the functional interactions of the bacterial division machinery (the divisome) to reconstruct, from the bottom up, operating simplified versions of the divisome in controlled cell-like environments, in the absence of cells.

Our research program, framed on the quest to build synthetic cells from scratch, integrates biochemistry, molecular biophysics, membrane reconstitution, and bottom-up synthetic biology approaches. We combine our expertise in biochemistry and biophysics of different membrane systems and protein machines to design modular reaction environments that resemble the physical appearance of a cell and its key substructures, implementing physical-chemical features essential to support cell division. Achieving these goals will be an essential step towards designing genuinely life-like synthetic cells and an unrivaled tool to scrutinize our fundamental understanding of the basic mechanisms of life. The knowledge acquired and the tools developed will contribute to understanding how bacteria control their cell cycle events and organize the intracellular space; they will also be instrumental in eventually dividing proto-cellular systems. These insights on an essential cellular machine will open novel horizons to translate them into resources to curb bacterial proliferation. At the same time, these minimal cell-like systems will constitute a powerful platform for the future engineering of systems, devices, and materials with novel functionalities of biotechnological added value.

- Molecular interactions in bacterial division
- Macromolecular crowding and phase separation in bacterial division:
- Reconstructing bacterial division in cytomimetic environments:
- Enabling tools
- Exploitation in antimicrobial discovery and technology

- CSIC steering committee member at the European Synthetic Cell Initiative
- Director - CSIC-UIMP advanced masters in integrative molecular cell & synthetic biology

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