



# CiMUS International PhD Programme

## 1. Project title:

**Role of extracellular SUMO in virus infection, immune activation, and cancer progression**

## 2. Research Project:

The extracellular compartment is a highly dynamic signaling environment that profoundly influences both cancer progression and viral pathogenesis. Tumors and virus-infected cells alter the secretion of cytokines, chemokines, extracellular matrix components, metabolites, damage-associated molecular patterns (DAMPs), and extracellular vesicles, remodeling the extracellular milieu. These changes modulate immune cell recruitment, inflammatory activation, angiogenesis, and stromal remodeling, ultimately determining cancer cell survival, metastatic potential, resistance to therapy, virus replication, immune evasion, and viral systemic dissemination. This project encompasses basic research trying to elucidate the activities of extracellular *Small Ubiquitin-like Modifier* (SUMO) proteins and to define their impact on viral infection and cancer progression, processes with substantial biomedical relevance. By addressing this biological question, the project opens a research avenue at the intersection of extracellular vesicle biology, cancer cell biology, immunology, and virology. The multidisciplinary nature of this project, combining expertise on the role of ubiquitin-like proteins in virus and cancer (Dr. Carmen Rivas) with immunity and small molecules (Dr. Iria Gómez-Touriño), is expected to enhance international visibility and to foster high-impact publications, collaborative opportunities, and technological innovation.

Extracellular SUMO may function as a biomarker of tumor progression, immune activation, viral spread or treatment response. Understanding its mechanisms may contribute to improved cancer immunotherapies, new antiviral strategies for emerging viral threats, and innovative approaches to control pathological inflammation.

In this project, we propose to define the role of extracellular SUMO in the context of virus infection, immune activation, and cancer progression. We will investigate its activities and signaling mechanisms on immune cells, assess its impact on cancer progression and virus replication using *in vitro* systems, and validate these findings in relevant *in vivo* models. This work has the potential to uncover new mechanisms of intercellular communication in host defense and cancer, identify potential biomarkers of immune system dysfunction, chronic inflammation, stress and infection, and reveal novel therapeutic strategies targeting cancer and virus infection.



### 3. Job position description:

#### Key Responsibilities:

The candidate will take care of designing, and performing experiments with PBMCS, developing *in vitro* assays, and evaluating *in vivo* models. The candidate will have to present his/her work in weekly lab meetings, workshops, as well as in national and international meetings. The research will involve techniques in molecular biology, immunology, virology, and cell biology, enabling the candidate to develop skills and learning in different areas from virology, cancer and immunology.

#### Requirements for candidates: (Essential and/or desirable)

The position is open for motivated and enthusiastic PhD candidates with background in biology, virology, biochemistry or immunology.

### 4. Supervisor and Co-Supervisor

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Research group: Virus and cancer

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Research group: Immunity and Small Molecules

Link to the group website: <https://cimus.usc.gal/es/grupo/immunity-and-small-molecules>