

**CURRICULUM VITAE ABREVIADO (CVA)**

**IMPORTANT** – The Curriculum Vitae **cannot exceed 4 pages**. Instructions to fill this document are available in the website.

**Part A. PERSONAL INFORMATION**

First name	Miriam		
Family name	Royo	Expósito	
Gender (*)	Female	Birth date (dd/mm/yyyy)	25/05/1963
Social Security, Passport, ID number	35.059.562H		
e-mail	miriam.royo@iqac.csic.	URL Web	<a href="https://www.iqac.csic.es/research/departments/surfactants-and-nanobiotechnology/multivalent-systems-for-nanomedicine/">https://www.iqac.csic.es/research/departments/surfactants-and-nanobiotechnology/multivalent-systems-for-nanomedicine/</a>
Open Researcher and Contributor ID (ORCID) (*)	<a href="https://orcid.org/0000-0001-5292-0819">0000-0001-5292-0819</a>		

(\*) Mandatory

**A.1. Current position**

Position	Scientific researcher (investigadora científica) CSIC		
Initial date	09/07/2018		
Institution	Agencia Estatal Consejo Superior de Investigaciones Científicas-CSIC		
Department/Center	Instituto de Química Avanzada de Cataluña (IQAC-CSIC)		
Country	Spain	Teleph. number	934006100
Key words	chemical biology, peptides, dendrimers, targeting/homing units, GPCR, drug delivery systems, bivalent ligands ligands, cancer, combination therapy, rare diseases		

**A.2. Previous positions (research activity interruptions, indicate total months)**

Period	Position/Institution/Country/Interruption cause
2002-08/07/2018	PI and director of Combinatorial Chemistry/Barcelona Science Park/ Spain
1997-2001	Post-doc researcher/ University of Barcelona/Spain
1994-1996	Post-doc researcher/Beth Israel Deaconess Medical Center-Harvard Medical School, Boston/USA

**A.3. Education**

PhD, Licensed, Graduate	University/Country	Year
PhD (Chemistry)	University of Barcelona	1994
Master in Organic Chemistry	University of Barcelona	1998
Bachelor's degree (Chemistry)	University of Barcelona	1987

**Part B. CV SUMMARY** (max. 5000 characters, including spaces)

Miriam Royo graduated in chemistry from the University of Barcelona in 1987, where she also obtained her PhD. During her PhD, she worked on a project based on peptide chemistry,



focusing on the study of the effect of the helix dipole on its self-assembly organisation and the development of two new Cys protecting groups. She then completed her first postdoctoral fellowship at the Beth Israel Deaconess Medical Center-Harvard Medical School in the Division of Bone and Mineral Metabolism (Boston, USA). During this period, her work focused on the development of PTH/PTHrP peptide ligands as potential therapeutic agents for osteoporosis, the design and synthesis of GPCR loop mimics and the synthesis of  $\alpha_v\beta_3$  peptide ligands. From 1997 to 2001, she carried out a second postdoctoral fellowship at the University of Barcelona, where he worked on the development of a new family of polyproline-peptide-based dendrimers and the study of their application as drug delivery platforms. During this period, she also worked on the development of new methodologies for combinatorial chemistry and the synthesis and structural elucidation of marine depsipeptides with antitumour properties.

In 2002, Dr Royo was awarded a Ramon y Cajal contract to work at the Barcelona Science Park as PI and Director of the Combinatorial Chemistry Unit (UQC-PCB), where she started her independent research career. In July 2018, she became a scientific researcher at the Institute of Advanced Chemistry of Catalonia (IQAC-CSIC), where she leads the "Multivalent system for nanomedicine" (MS4N) group. Dr Royo's research is currently focused on the development of multivalent chemical tools and the study of their application as therapeutic/pharmacological tools in cancer, neurological and rare diseases. She is also an expert in peptide synthesis and conjugation, targeting peptides to various nanostructures. Her group has developed a family of  $\gamma$ -peptide foldamers based on cis-4-aminoproline, which can cross cell membranes of specific cells and are strong candidates to be considered as transporters. Some of these compounds have shown anti-Alzheimer's properties and the ability to cross the blood-brain barrier. Dr Royo's group has also developed a new family of biocompatible oligothreylene glycol-based dendrimers and is investigating their applications in imaging and drug delivery. These multivalent platforms are also multimodal, making them highly versatile systems that have been used to synthesise new multivalent pharmacological tools to study class A GPCR oligomers. Her group has developed bivalent and multivalent ligands for the D2R and A2AR receptors, which have allowed the detection of oligomers of these receptors in native tissues. These tools are currently being used by other groups to trap GPCR dimers in order to elucidate their structure by cryo-EM (in collaboration with Javier Nafria (BIFI) and Yang Lee (MCS-LMB)). Furthermore, she is also developing novel therapeutic agents based on this bivalent ligand strategy for movement disorders (such as Parkinson's disease, spinal cord injury and restless legs syndrome). She has also been involved in the design and synthesis of novel targeting moieties used in the development of targeted protein delivery systems for Fabry disease. This protein delivery system has recently been granted Orphan Drug Designation by the European Medicines Agency. The synthesis process developed is currently being used for the GMP production of this moiety. During her scientific career, Dr Royo has participated in three European projects (ReachGlio, Mephitis and Smart4Fabry), 22 national competitive projects (12 as PI) and 10 competitive projects from regional, local organisations and foundations (5 as PI). She has also participated in 33 collaborative research projects (31 as PI) with national and international pharmaceutical companies (Lilly, Servier, Oryzon Genomics, etc.). She has trained 15 PhD students, 3 of whom received the "Extraordinary Award" for their thesis work.

Since 2021 she is the manager of the "Agencia Estatal de Investigación" (AEI) in the field of biomedicine, subdivision of "herramientas diagnósticas, pronósticas y terapéuticas".

### **Part C. RELEVANT MERITS** (sorted by typology)

#### **C.1. Publications**

P. Camara-Sánchez, ..... **M. Royo**, ..... I. Abasolo(AC) 7/10 (2022) Selectively Targeting Breast Cancer Stem Cells by 8-Quinololinol and Niclosamide. *Int. J. Mol. Sci.* 23, 11760.

D. Pulido, ..., L. Pardo (AC, V. Casadó (AC). **M. Royo** (AC) 10/10 (2022) Heterobivalent Ligand for the Adenosine A2A–Dopamine D2 Receptor Heteromer. *J. Med. Chem.* 65, 616-632.

E. Cristobal-Lecina, D. Pulido, P. Martin-Malpartida, M. J. Macias, F. Albericio, **M. Royo (AC)** (2020) Synthesis of Stable Cholesteryl-Polyethylene Glycol-Peptide Conjugates with Non-Disperse Polyethylene Glycol Length. *ACS Omega* 5, 5508-5519.



M. Pesarrodonna, ....., D. Pulido, ....., **M. Royo**, ....., I. Abasolo, E. Vázquez (AC) 12/15 (2020) Engineering a Nanostructured Nucleolin-Binding Peptide for Intracellular Drug Delivery in Triple-Negative Breast Cancer Stem Cells. *ACS Appl. Mater Inter.* 12, 5381-5388.

D. Pulido, V. ...S. Ferré, L. Pardo (AC), V. Casadó (AC), **M. Royo** (AC) 10/10 (2018). Design of a true bivalent ligand with picomolar affinity for a G protein-coupled receptor homodimer. *J. Med. Chem.* 61, 9335-9346.

A. Molero, M. Vendrell (AC), ... **M. Royo** (AC) 12/12 (2015). A solid-phase combinatorial approach for indoloquinolizidinepeptides with high affinity at D<sub>1</sub> and D<sub>2</sub> dopamine receptors. *Eur. J. Med. Chem.* 97, 173-180.

C. de la Torre, ...**M. Royo** (AC), F. Sancenón, R. Martínez-Máñez (AC) 9/11 (2015). Gated mesoporous silica nanoparticles using a double-role circular peptide for the controlled and target-preferential release of doxorubicin in CXCR4-expressing lymphoma cells. *Adv. Funct. Mat.*, 25, 687-695.

P. Fransen, D. Pulido, C. Sevrin, C. Granfils, F. Albericio (AC) , **M. Royo** (AC) (2014). High control, fast growth OEG-based dendron synthesis via a sequential process of copper free-diazo transfer and click chemistry. *Macromol.* 47, 2585–259.

D. Pulido, F. Albericio, (AC) **M. Royo** (AC) (2014). Controlling multivalency and multimodality: up to pentamodal dendritic platforms based on diethylenetriaminepentaacetic acid cores. *Org. Lett.* 16, 1318–1321.

R. J. Seelbach, ....., D. Pulido, ..., **M. Royo**, A. Mata (AC) , D. Eglín (AC) 13/15 (2014). Multivalent dendrimers presenting spatially controlled clusters of binding epitopes in thermoresponsive hyaluronan hydrogels. *Acta Biomater.* 10, 4340-4350.

### C.3. Research projects

-01/01/2024-31/12/2026: "Reaching the heterogeneous vascular landscape of glioblastoma with multifunctional nanomedicines" ERA-NET cofund on Translational Cancer Research Instituto de Salud Carlos III, TRANSCAN-3-ISCIII (REACHGLIO, AC23\_1/00011). Ibane Abasolo (IP WP1), **Miriam Royo** (co-IP WP1), CIBER BBN (Budget associated to MS4N group: 75.000 €)

-01/09/2023-30/08/2027: "Multivalent chemical systems as therapeutic agents for cancer and movement disorders" Agencia Estatal de Investigación-Ministerio de Ciencia, Innovación y Universidades, AEI-MICINN (PID2022-139278OB-I00), **Miriam Royo** (PI), CSIC (160.000€).

-01/05/2021-31/12/2022: "Iniciativa estratégica de diagnóstico". PTI+ Salud Global, CSIC, Coordinated project SGL2021-03-039. **Miriam Royo** (Participant WP2-IVD), CSIC (Budget associated to MS4N group: 30.273,47 €).

-01/05/2021-1/12/2022: "Iniciativa estratégica de antivirales". PTI+ Salud Global, CSIC, Coordinated project SGL2021-03-050. **Miriam Royo** (Participant WP1), CSIC (Budget associated to MS4N group: 79.583,33 €)

-05/06/2020/05-06-2022: "TAG-SMARTLY: Targeted Quatsome Nanocarriers for the Delivery of microRNA for neuroblastoma therapy". Proyectos de Valorización CIBER-BBN 2020. Coordinator: Nora Ventosa. Participants: **Miriam Royo** (PI partner 2; IQAC-CSIC, CIBER BBN, MS4N group (8.000 €)); Miquel Guinart (VHIR).

-15/08/2020-14/08-2021: ADVISOR: ACE2-derived-peptide super-binders with enhanced affinity for inhibition of SARS-COV-2 infection. Fondo Supera COVID-12 Santander-CRUE, **Miriam Royo** (PI partner 2), CSIC (31.053€).



-01/01/2019-31/12/2022: “Multivalent systems for Nanomedicine” (MS4N), Miriam Royo (PI). Ministerio de Ciencia, Innovación y Universidades, MICINN (RTI2018-093831-B-I00), **Miriam Royo** (PI), CSIC (150.000€).

-01/01/2017-31/12/2020: “*Smart multifunctional GLA-nanoformulation for Fabry disease*”. European Community Horizon 2020, NMBP-2016-2STAGE-HEALTH. “(SMART-4-FABRY, grant number: 720942-2) Coordinated project. Coordinator: Nora Ventosa, CIBER budget associated to **Miriam Royo**’s group 295.965,45€.

-01/01/2015-30/10/2019: “Chemical tools to study their interaction with biological barriers and GPCR oligomers”. Ministerio de Economía y Competitividad–MINECO (SAF2014-60138-R). **Miriam Royo** (PI). Parc Científic de Barcelona (178.000 €). Moved to CSIC on November 2018.

-01/04/2014-31/03/2017: “Personalized nanomedicine for triple negative breast cancer stem cells”. Fundació La Marató TV3 (20133932). **Miriam Royo** (PI, partner 3). Parc Científic de Barcelona (109.887,5 €)

#### **C.4. Contracts, technological or transfer merits**

##### **Contracts**

-01/03/2024-28/02/2028: “Nano4Pompe: Development of a new nanocarrier- based alpha-glucosidase (GAA) delivery technology for the treatment of Pompe disease”. Investigator Sponsored Trials (IST) Program. Pre-clinical studies, Sanofi-Aventis. Coordinator: Jordi Día-Maner (U. Newcatle, UK). Miriam Royo (PI subproject 3). (161.963 £).

-01/10/2013-30/03/2018: “Synthesis of compound of biological interest” Servier Laboratoires, France. PI: Miriam Royo/Fernando Albericio. Parc Científic de Barcelona (450.000 €)

-01/04/2014-31/12/2017: “*Proyecto de Química Médica*”. Landsteiner Genmed (before NeoPharm Obesity, S.L., Spain) PI: Miriam Royo. Parc Científic de Barcelona (400.000 €)

-01/03/2014-28/02/2016: “Identificación de inductores umami y en el desarrollo de nuevos sistemas celulares adecuados al screening funcional de sus moléculas”. LUCTA, S.A., Spain PI: Miriam Royo Parc Científic de Barcelona (70.000 €)

##### **Patents**

Inventors: L. Ventosa, J. Veciana, J. Tomsen, E. González, E. Cristóbal, **M. Royo**, D. Pulido, S. Sala, J. L. Corchero, S. Schwartz, I. Abasolo, A. Córdoba, J. Merlo, A. Soldevila, A. Font. EU/3/20/2396 Title: A-Galactosidase A (Orphan Drug Designation) Applicants: CSIC, CIBER, VHIR, Nanomol Technologies S,L., Leanbio, S.L. Priority date: 06/01/2021

Inventors: L. Ventosa, J. Veciana, J. Tomsen, E. González, E. Cristóbal, **M. Royo**, D. Pulido, S. Sala, J. L. Corchero, S. Schwartz, I. Abasolo, A. Córdoba, J. Merlo, A. Soldevila, A. Font. PCT/EP2022/051727. Title: Liposomes and its use for enzyme delivery. Applicants: CSIC, CIBER, VHIR, Nanomol Technologies S,L., Leanbio, S.L. Priority date: 26/01/2021

Inventors: L. Rull, J. Veciana, I. Cabrera, E. Elizondo, M. Melgarejo, **M. Royo**, F. Albericio, D. Pulido. S. Sala, J. L. Corchero, S. Schwartz, Simó; I. Abasolo, A. P. Villaverde. WO2014/001509. Title: Functionalized liposomes useful for the delivery of bioactive compounds. EP2866839, JP2015522578, US20150190530, BR1120140329, RU2015102810, CN104507503, ES2696623 Applicants: CSIC, CIBER, UB, PCB, UAB, VHIR. Priority date: 03/01/2014. Licenced: Nanomol Technologies, S. L.