

Part A. PERSONAL INFORMATION

First name	Miguel Ángel		
Family name	Moreno Mateos		
Gender (*)	Male	Birth date (dd/mm/yyyy)	
Social Security, Passport, ID number			
e-mail		URL Web:	
Open Researcher and Contributor ID (ORCID) (*)			

(*) Mandatory

A.1. Current position

Position	Científico Titular and Group Leader		
Initial date	9th January 2024		
Institution	CSIC: Centro Andaluz de Biología del Desarrollo (CABD)		
Department/Center	Biotechnology and Cell Biology	CABD (CSIC/UPO/JA)	
Country	Spain	Teleph. number	
Key words	CRISPR-Cas, RNA, early development, vertebrates, zebrafish, zygotic genome activation, cellular reprogramming		

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

Period	Position/Institution/Country/Interruption cause
Sept. 2000- May 2006	PhD Student. Dept. of Genetics, University of Seville. Spain
Sept. 2006- Dec. 2008	Postdoc. CABIMER, CSIC. Seville, Spain
Jan. 2009- Sept. 2010	Postdoc. CABIMER-CSIC- Newbiotechnic S.A. Seville, Spain.
Oct. 2010- March 2013	Postdoc. CABIMER, CSIC. Seville, Spain
April 2013- Dec. 2017	Associate Research Scientist. Dept. Genetics. Yale Univ. CT, USA.
March 2018- Jan. 2019	Senior Postdoc. CABIMER. Fundación Progreso y Salud. Seville, Spain
1 st Feb 2019- 8th January 2024	Ramón y Cajal Researcher. Universidad Pablo de Olavide (UPO) and Junior Group Leader at CABD

A.3. Education

PhD, Licensed, Graduate	University/Country	Year
Biology (Licensed)	Universidad de Sevilla	2000
Molecular and Cellular Biology (PhD)	Universidad de Sevilla	2006

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

My PhD (U. Seville, directed by Dr. Benítez) investigated fungal Pac1's role in *Trichoderma harzianum*. This resulted in **three publications** in microbiology and fungal biology journals (including a first-author paper in *Fungal Genetics and Biology*, 2007) and three book chapters. Supported by a FPI fellowship, I conducted a short-term visit at CIB (Madrid) with Dr. Miguel A. Peñalva. After my PhD, I joined Dr. José A. Pintor-Toro's lab at CABIMER-CSIC (Seville) to study cancer biology and develop new biomedical technologies. I first analyzed the role of the oncogene *pttg1* in adipocyte differentiation and microtubule nucleation, publishing these findings in *Mol. Biol. Cell* (2009 and 2011, both first-author). I then developed and **patented** novel small RNA libraries for functional genetic screens

(WO/2009/071722, WO/2010/081842), identifying novel miRNAs involved in cell death regulation (**published in RNA**). Supported by a **Torres Quevedo** postdoctoral contract and in collaboration with Newbiotechnic S.A. and the Pintor-Toro lab, this postdoctoral period further enhanced my expertise in molecular and cellular biology and developed my leadership skills through corresponding authorship and Master and undergraduate students' supervision. In 2012, I was awarded with a **competitive grant from the Andalusian Government** (*Perfeccionamiento y Retorno*) to join the Dr. Antonio Giraldez lab at Yale University as an Associate Research Scientist to work on **CRISPR-Cas** genome editing optimization and its application to study early development and human diseases in zebrafish (20132017). As part of this second postdoctoral training, I uncovered the rules that govern CRISPR-Cas9 activity and developed an algorithm to select efficient targets *in vivo* (<http://www.crisprscan.org>). Furthermore, I also optimized the CRISPR-Cpf1 (Cas12a) system expanding the targeting landscape for *in vivo* CRISPR applications. These results were published in **Nature Methods** and **Nature Communications**. From these projects I also published several **papers for methodologies and reviews**. Applying our optimized CRISPR-Cas systems we uncovered (**PLoS Genetics 2018**) new genes involved in vertebrate brain development. In 2018, I was awarded with the **Ramon y Cajal grant** and I joined UPO and CABD (Seville) starting my own lab, in February 2019 being appointed **Junior PI** (Springboard program at CABD). Since then, we have been studying and optimizing new CRISPR-Cas systems and their applications *in vivo* that combined with genomics, transcriptomics and proteomics and molecular biology approaches have contributed to better understand embryonic pluripotency, cellular reprogramming and early vertebrate development (Chan SH et al., **Developmental Cell**. 2019; Kushawah G et al., **Developmental Cell**. 2020-Cover of the issue-; Hernandez-Huertas L et al., **Star Protocols** 2022, Vicencio J et al., **Nature Communications** 2022, Moreno-Sanchez I et al., **Nature Communications** 2025, Hernandez-Huertas L et al., **BioRxiv** and **Nat Str& Mol Biol under 2nd revision**). In total, I have accumulated 1947 citations (Scopus). Furthermore, our expertise and work has also facilitated several **collaborations with companies** and consolidated an important **network** including international collaborations (Harvard, U. Zurich, Stowers Inst., CRISPR COST action, etc.) and the **organization of two international CRISPR Workshops** (UNIA 2021, EMBO 2023). In addition, I will be organizer of the next SEBD meeting and in March I will apply as main organizer of a MZT EMBO workshop in Seville, both in 2026. My scientific projects have been regularly presented as **invited talks** in international and national research institutes (Stowers Inst., USA; Max Planck Munster, Germany; U. Conn. USA; PBRR and IRB Barcelona; SEG courses, Madrid, etc.) and conferences (see some examples below) but also in **dissemination activities** (European Researchers Night, high schools, 11F, Pint of Science, etc.). My lab has been funded by international, national, regional and intramural grants and it's part of the *María de Maeztu* excellence program (CEX2020-001088-M) at CABD. I am the **supervisor of five PhD students** (two FPI, FPU Junta de Andalucía, CONAHCYT and BBD BioPhenix S.L. collaboration student) who together with a **postdoc** (former Margarita Salas contract), two Master students, and a lab manager are the core of my lab. In addition, I have directed 8 TFM and 6 TFG and I have participated as national (Ramon y Cajal and national and regional projects) and international grants (Eureka, DFG, etc.) and manuscripts (Nature Biotech., Nat Comm. Cell Rep., Science Adv., Genome Res., Genome Biol., etc.) reviewer. I have I3 and "Contratado Doctor" accreditations and I currently have a **permanent position in the Spanish Research Council (CSIC)** as "Científico Titular" (from January 2024) and I was appointed Senior PI at CABD in October 2023.

Part C. RELEVANT MERITS (sorted by typology)

C.1. Publications (last ten years)

- 1) I. Moreno-Sanchez, L*. Hernandez-Huertas*, D. Nahon-Cano*,... M.A. Moreno-Mateos⁺ (20/20) (2025). Enhanced RNA-targeting CRISPR-Cas technology in zebrafish. **Nature Communications**, 16: 2591.
- 2) D. Böck, I.M. Revers, A.S.J. Bomhof,..., M.A. Moreno-Mateos,...,G. Schwank (8/11) (2024). In vivo base editing of a pathogenic Eif2b5 variant improves vanishing white matter phenotypes in mice. **Mol. Therapy**, 32 (5):1328-1343.

- 3) J.A. Del Prado, Y. Ding, J. Sonnevile, K.V. der Kolk, M.A. Moreno-Mateos, E. Málaga-Trillo, H.P. Spaink (2024). Comparing robotic and manual injection methods in zebrafish embryos for highthroughput RNA silencing using CRISPR-RfxCas13d. **Biotechniques**, 76 (5):183-191.
 - 4) A.M. Brokate-Llanos, M. Sanchez-Ibañez, M.M. Pérez-Jiménez, J.M. Monje-Moreno, C. GómezMarín, C. Caro, C. Vivar-Rios, M.A. Moreno-Mateos, ..., J.L. Royo (7/10) (2024). Ribonucleotide reductase inhibition improves the symptoms of a *Caenorhabditis elegans* model of Alzheimer's disease. **G3**. 14(5):jkae040.
 - 5) J. Vicencio*, C. Sánchez-Bolaños*, I. Moreno-Sánchez,...J. Cerón⁺, M.A. Moreno-Mateos⁺ (17/17) (2022). Genome editing in animals with minimal PAM CRISPR-Cas9 enzymes. **Nature Communications**, 13 (1): 2601
 - 6) L. Hernandez-Huertas, G. Kushawah, A. Diaz-Moscoso, L. Tomas-Gallardo, I. Moreno-Sanchez, G. da Silva Pescador, A. A. Bazzini⁺, M. A. Moreno Mateos⁺ (2022). Optimized CRISPR-RfxCas13d system for RNA targeting in zebrafish embryos. **STAR Protocols**, 3 (1): 101058.
 - 7) G. Kushawah, L. Hernandez-Huertas, J. Abugattas-Nuñez del Prado... A. A. Bazzini⁺, M. A. MorenoMateos⁺ (21/21) (2020). CRISPR-Cas13d induces efficient mRNA knock-down in animal embryos.
 - Developmental Cell** 54 (6): 805-817.
 - 8) S. H. Chan, Y. Tang, L. Miao...M. A. Moreno-Mateos⁺, A. J. Giraldez⁺ (10/11) (2019). Brd4 and P300 confer transcriptional competency during zygotic genome activation. **Developmental Cell** 49 (6): 867881.
 - 9) J.P. Fernandez*, M.A. Moreno-Mateos*, A. Gohr, L. Miao, S. H. Chan, M. Irimia, A.J. Giraldez (2018). RES complex is associated with intron definition and required for zebrafish early embryogenesis. **PloS Genetics** 14 (7) e1007473.
 - 10) J. P. Fernandez, C. E. Vejnar, A. J. Giraldez⁺, R. Rouet⁺, M. A. Moreno-Mateos⁺ (2018). Optimized CRISPR-Cpf1 system for genome editing in zebrafish. **Methods** 150:11-18.
 - 11) A.A. Bazzini, F. Del Viso, M.A. Moreno-Mateos, ...A.J. Giraldez (3/11) (2016). Codon identity regulates mRNA stability and translation efficiency during the maternal-to-zygotic transition. **EMBO J**. 4;35(19):2087-2103.
 - 12) D.M. Kasper, A. Moro, E. Ristori, A. Narayanan, G. Hill-Teran, E. Fleming, M. Moreno-Mateos... S. Nicoli (7/14) (2017). MicroRNAs Establish Uniform Traits during the Architecture of Vertebrate Embryos. **Developmental Cell**. 27;40(6):552-565.e5.
 - 13) C.E. Vejnar*, M.A. Moreno-Mateos*, D. Cifuentes, A.A. Bazzini and A.J. Giraldez (2016). Optimized CRISPR-Cas9 system for genome editing in zebrafish. **Cold Spring Harb Protoc**. 9:117 – 133
 - 14) C.E. Vejnar*, M.A. Moreno-Mateos*, D. Cifuentes, A.A. Bazzini and A.J. Giraldez (2016). Optimization Strategies for the CRISPR–Cas9 Genome Editing System. **Cold Spring Harb Protoc**. 9:113 – 116. Review article.
 - 15) M. A. Moreno-Mateos⁺, J. P. Fernandez, R. Rouet... A. J. Giraldez⁺ (1/9) (2017). CRISPR-Cpf1 mediates efficient homology-directed repair and temperature-controlled genome editing. **Nature Communications** 8 (1): 2024.
 - 16) M.A. Moreno-Mateos*, C. E. Vejnar *, J-D. Beaudoin, J. P. Fernandez, E. K. Mis, M. Khokha and A. J. Giraldez (2015). CRISPRscan: designing highly efficient sgRNAs for CRISPR/Cas9 targeting in vivo. **Nature Methods**. 12 (10): 982-88.
- BioRxiv preprint:*
- L. Hernandez-Huertas, I. Moreno-Sanchez, J. Crespo-Cuadrado, A. Vargas-Baco, G. da Silva Pescador, J.M. Santos-Pereira, A.A. Bazzini⁺, M.A. Moreno-Mateos⁺. CRISPR-RfxCas13d screening uncovers Bckdk as a post-translational regulator of the maternal-to-zygotic transition in teleosts. **BioRxiv**. PMID: 38826327. **Nature Structural & Molecular Biology**, 2nd revision.

*Equal contribution, ⁺Corresponding Authors.

For a whole list of publication <https://pubmed.ncbi.nlm.nih.gov/?term=morenomateos+m&sort=date>

C.2. Congress (most relevant form last ten years)

Please note despite I was invited to several meetings in 2024 such as COST action conference (Chipre) or Advanced Therapies Congress (UK), I did not travel past year due to a medical condition in my family.

- 1) M. A. Moreno-Mateos. **Invited speaker**. New Frontiers in CRISPR-Cas: Advancements past Cas9. 51st International Embryo Technology Society. 18-22 January 2025. Fort Worth, Texas, USA.
- 2) M. A. Moreno-Mateos. **Invited speaker & organizer**. RNA-targeting CRISPR-Cas screenings to understand early development of vertebrates. EMBO workshop: CRISPR-Cas: From biology to therapeutic applications. 7-10 November 2023, Seville, Spain.
- 3) M. A. Moreno-Mateos. **Invited speaker**. Optimizing CRISPR-Cas13 in zebrafish to understand early development. III World CRISPR day. Online event, 20th Oct. 2022. Organizer: Synthego Corporation.
- 4) M. A. Moreno-Mateos. **Invited speaker & organizer**. Uncovering post-translational regulators of early zebrafish development: a CRISPR-Cas13d RNA targeting approach. RiboRed. 26-27 May 2022. Miraflores de la Sierra, Madrid
- 5) M. A. Moreno-Mateos. **Invited speaker & organizer**. An optimized CRISPR-Cas13d in vivo system uncovers novel factors regulating early vertebrate development. CRISPR- Cas: from microbiology to biomedicine. UNIA Workshop, Baeza, Spain, 02-04 November 2021. Organizer: Universidad internacional de Andalucía (UNIA).
- 6) M. A. Moreno-Mateos. **Invited speaker**. Understanding early vertebrate development: A CRISPR-Cas13d view. 2nd Zebrafish Turkey Workshop. Online event, 18th March 2021. Organizer: Izmir Biomedicine and Genome Center & Institute, Dokuz Eylül University.
- 7) M. A. Moreno-Mateos. **Invited speaker**. CRISPR-Cas13 optimization in vivo. I World CRISPR day. Online event, 20th October 2020. Organizer: Synthego Corporation.
- 8) M. A. Moreno-Mateos. **Invited speaker**. CRISPRing zebrafish to understand vertebrate development. V LAZEN Symposium. Cuernavaca, Mexico, 11-12 May 2018. Organizer: Latin American Zebrafish Network (LAZEN).
- 9) M. A. Moreno-Mateos. **Invited speaker**. Optimizing CRISPR genome editing in vivo. 13th annual NMBIST Symposium on Genome Editing. Santa Fe, NM, USA, 15-17 March 2018. Organizer: NMINBRE & NCGR (New Mexico, USA).
- 10) M. A. Moreno-Mateos. **Invited speaker (opening lecture)**. Using an optimized CRISPR-Cas in vivo system to understand early development in vertebrates. IV LAZEN Symposium. Porto Alegre, Brazil, 9-10 December 2016. Organizer: Latin American Zebrafish Network (LAZEN).
- 11) M. A. Moreno-Mateos, S. H. Chan, J.P. Fernández, C.E. Vejnar and A.J. Giráldez. **Oral presentation**. Optimizing CRISPR-Cas9 to understand zygotic genome activation in vertebrates. Genome Engineering: The CRISPR-Cas revolution. Cold Spring Harbor, NY, USA, 08/2016. Organizer: Cold Spring Harbor Meetings.
- 12) M. A. Moreno-Mateos. **Invited speaker**. CRISPRscan: Designing Highly Efficient sgRNAs for CRISPR-Cas9 Targeting in Vivo CRISPR and Genome Engineering Conference. Organizer: GTCbio. Boston, MA, US. 05/2016
- 13) M. A. Moreno-Mateos. **Invited speaker**. CRISPRscan: designing highly efficient sgRNAs for CRISPR/Cas9 targeting in vivo. Genome Editing & Engineering Conference. Organizer: MNM. San Diego, CA, USA 02/2016

C.3. Research projects (last ten years)

- 1) Generación y consolidación de herramientas biotecnológicas y de edición genómica para el desarrollo y uso de biomodelos. Plan Complementario de I+D+I en el área de Biotecnología aplicada a la salud. Junta de Andalucía. 21/12/2023-30/09/2025 (203.479,47 €). Role: **Principal Investigator**. This is a grant part of a coordinated proposal with several subprojects summing a total of 1.400.000,00€. Coordinator PI: Mario Delgado (IPBLN-CSIC, Granada).
- 2) CRISPR-Cas13d RNA-targeting Optimization and Application to better understand early VERtebrate Development (CROAVED). MCIN-Ayudas para incentivar la consolidación investigadora. CNS2022135564. 01/09/2023-31/08/2025 (192.811,50 €). Role: **Principal Investigator**.

- 3) A systematic analysis of the post-translational control of zygotic genome activation in vertebrates: a CRISPR-Cas13d RNA targeting approach. MCIN. PID2021-127535NB-I00. 01/09/2022-31/08/2025 (199.650 € and FPI contract). Role: **Principal Investigator**.
- 4) European COST action: CA21113 - Genome Editing to Treat Humans Diseases (GenE-Humdi). September 2022-September 2026 (600.000 €). Role: **Researcher**
- 5) María de Maeztu Units of Excellence: "Decision Making in Cell Collectives Across Scales: Principles of Self-organization in Cell Communities". Spanish Ministry MIN. REF: CEX2020-001088-M, 012022/12-2025. Budget: 1.800.000,00 €. coPIs: Juan R. Martinez-Morales, Jaime Carvajal, Ana Rojas, José A. Sánchez-Alcazar, Javier López Ríos, Damien Devos, Juan Tena, Coordinator: Juan Pablo Couso. Role: **Researcher**
- 6) Nuevos factores reguladores de la transición materno cigótica en vertebrados: una aproximación CRISPR-Cas. Proyectos de I+D+i del programa FEDER 2020, Junta de Andalucía. UPO1380590. 01/06/2021-31/05/2023 (31.104 €), 1st position UPO ranking. Role: **Principal Investigator** (Co-PI: Juan Ramón Martínez-Morales, CABD- CSIC).
- 7) Identificación y Análisis de Nuevos Factores Reguladores de la Transición Materno Cigótica en Vertebrados. Proyectos de I+D+i de la Junta de Andalucía 2020, Junta de Andalucía. P20_00866. 01/06/2021-31/12/2022 (60.000 €). Role: **Principal Investigator**.
- 8) Adecuación de hábitats en el animalario de vertebrados acuáticos del CABD. Ayudas PAIDI a infraestructuras y equipamientos de i+d+i para entidades de carácter público. Proyectos Infraestructuras Junta de Andalucía 2019. IE19_079 UPO. December 2020-December 2022 (115.420,87 €). Role: **Principal Investigator**.
- 9) Destrucción del genoma RNA del coronavirus mediante CRISPR-Cas13d. Ayudas CSIC-COVID19, Plataforma de Salud Global. COVID19-127. 01/06/2020- 28/02/2022 (75.000 €, 25000 € for our lab). Role: **Principal Investigator** (Co-PIs: Lluís Montoliu (CNB-CSIC), Dolores Rodríguez (CNB-CSIC), Almudena Fernández (CIBERER, ISCIII).
- 10) Ayudas Plan Propio de la UPO 2020. Proyectos Puente para la concurrencia a Programas Internacionales de I+D 2020 and 2022 and Desarrollo líneas investigaciones propias 2002005188. (23.500 € in total). Role: **Principal Investigator**.
- 11) CRISPR-Cas optimizations in vivo. Synthego 2019 International Genome Engineering Innovation Grant. 01/07/2019-31/12/2020 (\$60000 in reagents from the company). Role: **Principal Investigator**.
- 12) Novel CRISPR-Cas *in vivo* applications to uncover new factors controlling early vertebrate development (CRISPRDEV). MICINN. PGC2018-097260-B-I00. 01/01/2019- 31/12/2021 (116.000 € + PhD Fellowship). Role: **Principal Investigator**. Real starting date September 2019
- 13) Ramón y Cajal Grant. MINECO. RYC-2017-23041. 01/02/2019- 09/01/2024 (308.600 €, including salary of the PI). Role: **Principal Investigator**.
- 14) Optimizaciones de la tecnología CRISPR-Cas y su aplicación en el estudio del desarrollo temprano y las enfermedades humanas. Springboard Lab and Maria de Maeztu start-up package at CABD. Feb. 2019- June 2021 (31.000 €). Role: **Principal Investigator**.
- 15) Molecular Characterization of the microRNA processing pathways (Universidad de Yale). R01 National Institute of Health (USA) 5R01GM101108-04. 2015-2017 (\$ 500.657). Role: **Researcher**
- 16) Andalusian Research Agreement between Fundación Progreso y Salud (Cosejería de Salud, Andalucía, Spain) and Yale Univeristy (Dept of Genetics). R11884 MGEN Moreno. 15/05/2013 14/05/2015 (113.592 € for salary and installation, meetings, conferences or other related scientific events while Dr. Moreno-Mateos was at Yale). Role: **Co-Principal Investigator** (M.A. Moreno-Mateos; A. J. Giraldez).

C.4. Contracts, technological or transfer merits

Contract: Desarrollo y validación de herramientas para su aplicación en terapias avanzadas. Sponsor: ZIP Solutions S.L. Role: Principal Investigator. March 2023- January 2025. 18000 €/year and a salary for a postdoctoral researcher of 30000 €/year.

Contract: Optimización de la edición génica usando el pez cebra como modelo. Sponsor: BBD BioPhenix S.L. Role: Principal Investigator. July 2021- November 2024. 20000 €/year and a salary for a PhD student of 22000 €/year

Contract: Synthego Cooperation and Moreno-Mateos lab agreement for essential laboratory materials from the company to develop a research project: optimization of CRISPR-Cas RNA-targeting in vivo. Role: Principal Investigator. September 2021 until the end of the project. **Patent:** Methods and kits to generate miRNA- and small RNA- expressing vectors and its application to develop lentiviral expression libraries. Inventors: Jose A. Pintor Toro; Miguel A. Moreno Mateos. Entity holder of rights: Consejo Superior de Investigaciones Científicas. Country of inscription: Spain. Date of register: 14/01/2010. WO/2010/081842. EU patent extended to USA in 2012. The invention was validated in a published paper (Moreno-Mateos MA, et al. 2013. RNA).

Contract: Torres Quevedo Grant. CABIMER (Pintor-Toro Lab) - Newbiotechnic S.A, PTQ-09-01-00584. Ministerio de Ciencia e Innovación, Jan. 2009- Sept. 2010. Related Patent WO/2010/081842 **Patent:** Metodos y kits para la preparación de genotecas de siRNAs específicas de un transcriptoma mediante transcripción convergente. Inventors: Jose A. Pintor Toro; Miguel A. Moreno Mateos; Ivan Valle Rosado. Entity holder of rights: Consejo Superior de Investigaciones Científicas. Country of inscription: Spain. Date of register: 04/12/2008. Nº of patent: WO/2009/071722. EU patent.