

BIOGRAPHICAL SKETCH

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NAME: Bruno David Lourenço Paiva

eRA COMMONS USER NAME (credential, e.g., agency login):

POSITION TITLE: Director Flow Cytometry Core; Co-Director Research Lab in Monoclonal Gammopathies

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE	Completion Date	FIELD OF STUDY
Faculty of Pharmacy. University of Coimbra (Portugal)	PharmD	06/2007	Pharmaceutical Sciences
Faculty of Medicine. University of Salamanca (Spain)	PhD	06/2011	Hematology, Flow Cytometry

A. Personal Statement

I joined the Hematology Department of the University Hospital of Salamanca as a PhD student in June 2007. In 2011, at age 27, I successfully completed my PhD program on the clinical significance of flow cytometry immunophenotyping in multiple myeloma. In 2013, I joined the Hematology Department of the University Clinic of Navarra as research fellow. In 2014, I was appointed Director of Flow Cytometry and Scientific Coordinator of the Hemato-Oncology diagnostic laboratories of our University. In 2019, I was appointed Director of the Monoclonal Gammopathies research laboratory in CIMA Universidad de Navarra.

With 15 years of research career, I have authorship in 180 publications, being first author in 40, last author and/or corresponding author in 20. Among them, there are several publications in the top journals such as the N Engl J Med, Nat Med, Cancer Cell, Lancet Oncol and J Clin Oncol, with impressive numbers in the most important Journal in Hematology: Blood (n = 30). More than 90% of the publications are in the Q1 of their respective specialty. At age 39, my h index is 48, with more than 10,000 citations (without self-citations) and an average of 69 citations per publication. I have been PI or Co-PI in 20 R&D projects funded through competitive calls of public or private entities, and established more than 15 R&D collaborative agreements with companies such as Amgen, Becton Dickinson, BMS-Celgene, GSK, Miltenyi, Janssen, Roche, Sanofi and Takeda. I have been awarded with numerous recognitions, including the Bart Barlogie Young Investigator Award for outstanding research developed in multiple myeloma, The Future Leaders in Hematology Award of the 2015 Celgene Awards for Clinical Research in Hematology, and the Brian GM Durie Outstanding Achievement Award in 2022. I am a frequent invited speaker in the most relevant international conferences in the fields of Hematology and Flow Cytometry (~20/year).

B. Positions, Scientific Appointments, and Honors

2007-2012 Research fellow in the Immunopathology laboratory (Hematology Department) University Hospital of Salamanca (Spain)

2013-2013 Research fellow in the Cancer Research Center (Myeloma Lab). University of Salamanca (Spain)

2013- Scientific staff. Hematology and Immunology Departments. Clinica Universidad de Navarra (Spain)

2014- Director Flow Cytometry core – CIMA LAB Diagnostics. University of Navarra (Spain)

2014-2020 Scientific Coordinator of CIMA LAB Diagnostics. University of Navarra (Spain)

2019- Co-Director Research Laboratory in Monoclonal Gammopathies

2009. Award Castilla&Leon Society of Hematology and Hemotherapy to the best oral presentation.

2011. Young Investigator Grant of the International Myeloma Workshop

2011. Special prize for PhD thesis presented in the University of Salamanca during 2010/2011.

2012. Award SEHH (Spanish Society of Hematology and Hemotherapy) to the best oral presentation.

2012. American Society of Hematology (ASH) abstract achievement award

2013. American Society of Hematology (ASH) abstract achievement award

2014. European Hematology Association (EHA) travel grant award
2014. American Society of Hematology (ASH) abstract achievement award
2015. Bart Barlogie Young Investigator Award In recognition to the outstanding research developed in the field of multiple myeloma from the International Myeloma Society
2015. The Future Leaders in Hematology Award of the 2015 Celgene Awards for Clinical Research in Hematology
2016. American Society of Hematology (ASH) abstract achievement award
2017. American Society of Hematology (ASH) abstract achievement award
2018. American Society of Hematology (ASH) abstract achievement award
2021. CRIS Foundation Excellence Award
2022. CIBERONC award to the most collaborative and consolidated investigator
2022. Otto Kahler Award from the Czech Myeloma Group
2022. Brian GM Durie Outstanding Achievement Award from the International Myeloma Foundation

C. Contributions to Science

Complete List of Published Work in My Bibliography:

<https://www.ncbi.nlm.nih.gov/myncbi/14EEqFzziwv5i/bibliography/public/>

Selection of 30 relevant manuscripts:

Paiva B, Manrique I, Dimopoulos MA, Gay F, Min CK, Zweegman S, Spicka I, Teipel R, Mateos MV, Giuliani N, Cavo M, Rojas C, Fu W, Suryanarayan K, Vorog A, Li C, Wang B, Estevam J, Labotka R, Dash AB. MRD dynamics during maintenance for improved prognostication of 1280 myeloma patients in TOURMALINE-MM3 and -MM4 trials. *Blood*. 2022 Sep 21;blood.2022016782.

Termini R, Žihala D, Terpos E, Perez-Montaña A, Jelínek T, Raab M, Weinhold N, Mai EK, Grab AL, Corre J, Vergez F, Sacco A, Chiarini M, Giustini V, Tucci A, Rodriguez S, Moreno C, Perez C, Maia C, Martín-Sánchez E, Guerrero C, Botta C, Garces JJ, Lopez A, Tamariz-Amador LE, Prosper F, Bargay J, Cabezero ME, Ocio EM, Hájek R, Martínez-Lopez J, Solano F, Iglesias R, Paiva A, Galdes C, Vitoria H, Gomez C, De Arriba F, Ludwig H, Garcia-Guiñón A, Casanova M, Alegre A, Cabañas V, Sirvent M, Oriol A, de la Rubia J, Hernández-Rivas JÁ, Palomera L, Sarasa M, Rios P, Puig N, Mateos MV, Flores-Montero J, Orfao A, Goldschmidt H, Avet-Loiseau H, Roccaro AM, San-Miguel JF, **Paiva B**; PETHEMA/GEM and iMMunocell Cooperative Groups. Circulating Tumor and Immune Cells for Minimally Invasive Risk Stratification of Smoldering Multiple Myeloma. *Clin Cancer Res*. 2022 Nov 1;28(21):4771-4781.

Guerrero C, Puig N, Cedena MT, Goicoechea I, Perez C, Garcés JJ, Botta C, Calasanz MJ, Gutierrez NC, Martín-Ramos ML, Oriol A, Rios R, Hernandez MT, Martínez-Martínez R, Bargay J, de Arriba F, Palomera L, Gonzalez-Rodriguez AP, Mosquera-Orgueira A, Gonzalez-Perez MS, Martínez-Lopez J, Lahuerta JJ, Rosiñol L, Blade J, Mateos MV, San-Miguel JF, **Paiva B**. A Machine Learning Model Based on Tumor and Immune Biomarkers to Predict Undetectable MRD and Survival Outcomes in Multiple Myeloma. *Clin Cancer Res*. 2022 Jun 13;28(12):2598-2609.

Alameda D, Goicoechea I, Vicari M, Arriazu E, Nevone A, Rodriguez S, Lasa M, Puig N, Cedena MT, Aligned D, Garate S, Lara-Astiaso D, Vilas-Zornoza A, Sarvide S, Ocio EM, Lecumberri R, Garcia de Coca A, Labrador J, Gonzalez ME, Palomera L, Gironella M, Cabañas V, Casanova M, Oriol A, Krsnik I, Perez-Montaña A, de la Rubia J, de la Puerta JE, de Arriba F, Fazio VM, Martínez-Lopez J, Lahuerta JJ, Mateos MV, Odero MD, Prosper F, Weiner A, Amit I, Nuvolone M, San Miguel JF, **Paiva B**. Tumor cells in light-chain amyloidosis and myeloma show distinct transcriptional rewiring of normal plasma cell development. *Blood*. 2021;138(17):1583-1589.

Paiva B, Vidriales MB, Sempere A, Tarín F, Colado E, Benavente C, Cedena MT, Sánchez J, Caballero-Velazquez T, Córdón L, Garces JJ, Simoes C, Martínez-Cuadrón D, Bernal T, Botella C, Grille S, Serrano J, Rodríguez-Medina C, Algarra L, Alonso-Domínguez JM, Amigo ML, Barrios M, García-Boyeró R, Colorado M, Pérez-Oteyza J, Pérez-Encinas M, Costilla-Barriga L, Sayas MJ, Pérez O, González-Díaz M, Pérez-Simón JA, Martínez-López J, Sossa C, Orfao A, San Miguel JF, Sanz MÁ, Montesinos P; PETHEMA (Programa para el Estudio de la Terapéutica en Hemopatías Malignas) cooperative study group. Impact of measurable residual disease by decentralized flow cytometry: a PETHEMA real-world study in 1076 patients with acute myeloid leukemia. *Leukemia*. 2021 Aug;35(8):2358-2370.

Garcés JJ, Cedena MT, Puig N, Burgos L, Perez JJ, Cordon L, Flores-Montero J, Sanoja-Flores L, Calasanz MJ, Oriol A, Blanchard MJ, Rios R, Martin J, Martínez-Martínez R, Bargay J, Sureda A, de la Rubia J, Hernandez MT, Rodriguez-Otero P, de la Cruz J, Orfao A, Mateos MV, Martinez-Lopez J, Lahuerta JJ, Rosiñol L, Blade J, San-Miguel JF, **Paiva B**. Circulating Tumor Cells for the Staging of Patients With Newly Diagnosed Transplant-Eligible Multiple Myeloma. *J Clin Oncol*. 2022 Sep 20;40(27):3151-3161.

Goicoechea I, Puig N, Cedena MT, Burgos L, Cordón L, Vidriales MB, Flores-Montero J, Gutierrez NC, Calasanz MJ, Ramos MM, Lara-Astiaso D, Vilas-Zornoza A, Alignani D, Rodriguez I, Sarvide S, Alameda D, Garcés JJ, Rodriguez S, Fresquet V, Celay J, Garcia-Sanz R, Martinez-Lopez J, Oriol A, Rios R, Martin-Sanchez J, Martinez-Martínez R, Sarra J, Hernandez MT, de la Rubia J, Krsnik I, Moraleda JM, Palomera L, Bargay J, Martinez-Climent JA, Orfao A, Rosiñol L, Mateos MV, Lahuerta JJ, Blade J, San Miguel J, **Paiva B**. Deep MRD profiling defines outcome and unveils different modes of treatment resistance in standard- and high-risk myeloma. *Blood*. 2021 Jan 7;137(1):49-60.

Perez C, Botta C, Zabaleta A, Puig N, Cedena MT, Goicoechea I, Alameda D, San José-Eneriz E, Merino J, Rodríguez-Otero P, Maia C, Alignani D, Maiso P, Manrique I, Lara-Astiaso D, Vilas-Zornoza A, Sarvide S, Riillo C, Rossi M, Rosiñol L, Oriol A, Blanchard MJ, Rios R, Sureda A, Martin J, Martinez R, Bargay J, de la Rubia J, Hernandez MT, Martinez-Lopez J, Orfao A, Agirre X, Prosper F, Mateos MV, Lahuerta JJ, Blade J, San-Miguel JF, **Paiva B**. Immunogenomic identification and characterization of granulocytic myeloid-derived suppressor cells in multiple myeloma. *Blood*. 2020 Jul 9;136(2):199-209.

Maia C, Puig N, Cedena MT, Goicoechea I, Valdes-Mas R, Vazquez I, Chillón MC, Aguirre P, Sarvide S, Gracia-Aznárez FJ, Alkorta G, Calasanz MJ, Garcia-Sanz R, Gonzalez M, Gutierrez NC, Martinez-Lopez J, Perez JJ, Merino J, Moreno C, Burgos L, Alignani D, Botta C, Prosper F, Matarraz S, Orfao A, Oriol A, Teruel AI, de Paz R, de Arriba F, Hernandez MT, Palomera L, Martinez R, Rosiñol L, Mateos MV, Lahuerta JJ, Blade J, San Miguel JF, **Paiva B**. Biological and clinical significance of dysplastic hematopoiesis in patients with newly diagnosed multiple myeloma. *Blood*. 2020 Jun 25;135(26):2375-2387.

Garcés JJ, Bretones G, Burgos L, Valdes-Mas R, Puig N, Cedena MT, Alignani D, Rodriguez I, Puente DÁ, Álvarez MG, Goicoechea I, Rodriguez S, Calasanz MJ, Agirre X, Flores-Montero J, Sanoja-Flores L, Rodriguez-Otero P, Rios R, Martinez-Lopez J, Millacoy P, Palomera L, Del Orbe R, Pérez-Montaña A, El Omri H, Prosper F, Mateos MV, Rosiñol L, Blade J, Lahuerta JJ, Orfao A, Lopez-Otin C, San Miguel JF, **Paiva B**; GEM/PETHEMA (Grupo Español de Mieloma/Programa para el Estudio de la Terapéutica en Hemopatías Malignas) cooperative study group. Circulating tumor cells for comprehensive and multiregional non-invasive genetic characterization of multiple myeloma. *Leukemia*. 2020 Nov;34(11):3007-3018.

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Moreno L, Perez C, Zabaleta A, Manrique I, Alignani D, Ajona D, Blanco L, Lasa M, Maiso P, Rodriguez I, Garate S, Jelinek T, Segura V, Moreno C, Merino J, Rodriguez-Otero P, Panizo C, Prosper F, San-Miguel JF, **Paiva B**. The Mechanism of Action of the Anti-CD38 Monoclonal Antibody Isatuximab in Multiple Myeloma. *Clin Cancer Res*. 2019 May 15;25(10):3176-3187.

Lahuerta JJ, **Paiva B**, Vidriales MB, Cerdón L, Cedena MT, Puig N, Martínez- Lopez J, Rosiñol L, Gutierrez NC, Martín-Ramos ML, Oriol A, Teruel AI, Echeveste MA, de Paz R, de Arriba F, Hernandez MT, Palomera L, Martínez R, Martín A, Alegre A, De la Rubia J, Orfao A, Mateos MV, Blade J, San-Miguel JF; GEM (Grupo Español de Mieloma)/PETHEMA (Programa para el Estudio de la Terapéutica en Hemopatías Malignas) Cooperative Study Group. Depth of Response in Multiple Myeloma: A Pooled Analysis of Three PETHEMA/GEM Clinical Trials. *J Clin Oncol*. 2017 Sep 1;35(25):2900-2910.

Kumar S, **Paiva B**, Anderson KC, Durie B, Landgren O, Moreau P, Munshi N, Lonial S, Bladé J, Mateos MV, Dimopoulos M, Kastritis E, Boccadoro M, Orłowski R, Goldschmidt H, Spencer A, Hou J, Chng WJ, Usmani SZ, Zamagni E, Shimizu K, Jagannath S, Johnsen HE, Terpos E, Reiman A, Kyle RA, Sonneveld P, Richardson PG, McCarthy P, Ludwig H, Chen W, Cavo M, Harousseau JL, Lentzsch S, Hillengass J, Palumbo A, Orfao A, Rajkumar SV, Miguel JS, Avet-Loiseau H. International Myeloma Working Group consensus criteria for response and minimal residual disease assessment in multiple myeloma. *Lancet Oncol*. 2016 Aug;17(8):e328-e346.

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Paiva B, Martínez-Lopez J, Corchete LA, Sanchez-Vega B, Rapado I, Puig N, Barrio S, Sanchez ML, Alignani D, Lasa M, García de Coca A, Pardal E, Oriol A, Garcia ME, Escalante F, González-López TJ, Palomera L, Alonso J, Prosper F, Orfao A, Vidriales MB, Mateos MV, Lahuerta JJ, Gutierrez NC, San Miguel JF. Phenotypic, transcriptomic, and genomic features of clonal plasma cells in light-chain amyloidosis. *Blood*. 2016 Jun 16;127(24):3035-9.

Paiva B, Corchete LA, Vidriales MB, Puig N, Maiso P, Rodríguez I, Alignani D, Burgos L, Sanchez ML, Barcena P, Echeveste MA, Hernandez MT, García-Sanz R, Ocio EM, Oriol A, Gironella M, Palomera L, De Arriba F, Gonzalez Y, Johnson SK, Epstein J, Barlogie B, Lahuerta JJ, Blade J, Orfao A, Mateos MV, San Miguel JF; Spanish Myeloma Group / Program for the Study of Malignant Blood Diseases Therapeutics (GEM / PETHEMA) Cooperative Study Groups. Phenotypic and genomic analysis of multiple myeloma minimal residual disease tumor cells: a new model to understand chemoresistance. *Blood*. 2016 Apr 14;127(15):1896-906.

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Paiva B, Corchete LA, Vidriales MB, García-Sanz R, Perez JJ, Aires-Mejía I, Sanchez ML, Barcena P, Alignani D, Jimenez C, Sarasquete ME, Mateos MV, Ocio EM, Puig N, Escalante F, Hernández J, Cuello R, García de Coca A, Sierra M, Montes MC, González-López TJ, Galende J, Báez A, Alonso J, Pardal E, Orfao A, Gutierrez NC, San Miguel JF. The cellular origin and malignant transformation of Waldenström macroglobulinemia. *Blood*. 2015 Apr 9;125(15):2370-80.

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Paiva B, Paino T, Sayagues JM, Garayoa M, San-Segundo L, Martín M, Mota I, Sanchez ML, Bárcena P, Aires-Mejia I, Corchete L, Jimenez C, Garcia-Sanz R, Gutierrez NC, Ocio EM, Mateos MV, Vidriales MB, Orfao A, San Miguel JF. Detailed characterization of multiple myeloma circulating tumor cells shows unique phenotypic, cytogenetic, functional, and circadian distribution profile. *Blood*. 2013 Nov 21;122(22):3591-8.

Paiva B, Montes MC, García-Sanz R, Ocio EM, Alonso J, de Las Heras N, Escalante F, Cuello R, de Coca AG, Galende J, Hernández J, Sierra M, Martin A, Pardal E, Báñez A, Alonso J, Suarez L, González-López TJ, Perez JJ, Orfao A, Vidriales MB, San Miguel JF. Multiparameter flow cytometry for the identification of the Waldenström's clone in IgM-MGUS and Waldenström's Macroglobulinemia: new criteria for differential diagnosis and risk stratification. *Leukemia*. 2014 Jan;28(1):166-73.

Paiva B, Gutiérrez NC, Rosiñol L, Vidriales MB, Montalbán MÁ, Martínez-López J, Mateos MV, Cibeira MT, Cordón L, Oriol A, Terol MJ, Echeveste MA, de Paz R, de Arriba F, Palomera L, de la Rubia J, Díaz-Mediavilla J, Sureda A, Gorosquieta A, Alegre A, Martin A, Hernández MT, Lahuerta JJ, Bladé J, San Miguel JF; PETHEMA/GEM (Programa para el Estudio de la Terapéutica en Hemopatías Malignas/Grupo Español de Mieloma) Cooperative Study Groups. High-risk cytogenetics and persistent minimal residual disease by multiparameter flow cytometry predict unsustained complete response after autologous stem cell transplantation in multiple myeloma. *Blood*. 2012 Jan 19;119(3):687-91.

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List of patents

- Diem Mihn; Klaus Strein; Bruno Paiva; Jesús San Miguel. WO2020/089437A1. Combination therapy 31/10/2019. ENGMAB.

- Diem Mihn; Klaus Strein; Bruno Paiva; Jesús San Miguel. WO2018/083204 A1. Bispecific antibody against BCMA and CD3 and an immunological drug for combined use in treating multiple myeloma Switzerland. 02/11/2017. ENGMAB.