

CURRICULUM VITAE of the PI

Part A. PERSONAL INFORMATION		CV date	Aug 2023
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A.1. Current position

Position	Researcher at INIA-CSIC (Profesora de investigación)		
Institution	Instituto Nacional de Investigación y Tecnología Agraria y Alimentaria (INIA-CSIC)		
Department	Mejora Genética Animal		
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Key words	Iberian pig, molecular genetics , genomics, nutrigenomics		

Part B. CV SUMMARY

Graduated in Veterinary Medicine in 1993 and specialized in animal production, I performed my doctoral studies (PhD in 1999) in the field of molecular genetics applied to the study of genome regions and candidate genes related to pig productive and meat quality traits. I was hired in an INIA sectorial project and enjoyed a *Ramón y Cajal* program contract, and I got a fixed position at INIA as scientist in the Department of Animal Breeding and Genetics in 2006. I have performed learning and collaboration stays at the Department of Human Genetics of the CNIO, the Breeding and Genetics area of the Faculty of Veterinary Medicine of the UAB and the Leibniz Institute for Farm Animal Biology (FBN). I have specialized in structural and functional study of genes of economic interest, especially in the regulation of gene expression and in the bioinformatics analysis of genomic and transcriptomic data. I have participated in projects related to the study of the genetic basis of productive traits (reproductive, growth, fattening, meat quality) in the pig, especially focused on the characterization of the Iberian pig, and for the last decade in projects including *omic* approaches (genomics, transcriptomics). In the last years I have participated in several multidisciplinary and interdisciplinary coordinated research projects of the National Plan and of the Community of Madrid (AGL2010, AGL2013, AGL2016, PID2019, CAM-S2009, CAM-S2013), which combined genetic, reproductive, management and nutritional studies, in which I have led the subprojects that provided a molecular genetics approach in pigs. Also in recent years, I have developed new lines of research related to the study of the interaction of diet with the genome function and intestinal microbiome (nutrigenomics, prenatal programming and metagenomics).

My works and projects have contributed relevant scientific information regarding the peculiar metabolic characteristics of Iberian pigs, including findings relative to the genetic basis and regulation of their obese phenotype, their leptin resistance and their persistent lipogenesis, which make this breed a good large animal model for studies on metabolic and cardiovascular diseases. I have also contributed with the description and analysis of specific genetic markers potentially useful for pig breeding programs, as well as with genomics and populational studies of the Iberian joint with other Mediterranean pig breeds. I have also provided a deep characterization of the transcriptome of different tissues in Iberian pigs as well as characterized the nutrigenomic effects of different functional nutrients and deepening in the understanding of early programming effects in pigs.

I have participated in 19 national projects being PI in 9 of them. In addition, I have led one European project (TREASURE), which allowed me to consolidate a wide international network of



collaborators in the area of fatty pig production. Besides, I have led or participated in five contracts with companies, including the main Spanish companies in the Iberian pig sector, involving both extensive and intensive production systems (Sanchez Romero Carvajal, Ibericogen, Ibéricos de Arauzo, Incarlopsa). I am now involved in two new Horizon Europe projects, leading one of them. I have directed nine doctoral theses and an additional one is currently in progress. During the development of my research, I have published more than 110 papers in recognized international journals in my field, most of them open access. I have participated in more than 200 communications to national and international congresses and have been invited 23 times as speaker. I am involved in scientific committees (ISAG functional genomics committee) and I am member of the editorial boards of several scientific journals (Animal, Plos One, Genes, Livestock Science). I have participated in many panels and committees for project evaluation at both national and international levels and have participated in the evaluation of researchers as member of different tribunals (for positions at INIA and for PhD thesis). I coordinate the “Quality, sustainability and nutrigenomics in swine production” research group at INIA-CSIC (former Pig breeding group). I am head of the Animal Breeding and Genetics department at INIA since 2020). *4 sexenios, 5 quinquenios.*

Part C. RELEVANT MERITS

C.1. Publications

Óvilo C, Trakooljul N, Núñez Y, Hadlich F, Murani E, Ayuso M, García-Contreras C, Vázquez-Gómez M, Rey AI, Garcia F, García-Casco JM, López-Bote C, Isabel B, González-Bulnes A, Wimmers K, Muñoz M. SNP discovery and association study for growth, fatness and meat quality traits in Iberian crossbred pigs. *Scientific Reports* (2022) 12:16361; <https://doi.org/10.1038/s41598-022-20817-0>

Ana Heras-Molina; Yolanda Núñez; Rita Benítez; Jose Luis Pesántez-Pacheco; Consolación García-Contreras; Marta Vázquez-Gómez; Susana Astiz; Beatriz Isabel; Antonio González-Bulnes; Cristina Óvilo. Hypothalamic transcriptome analysis reveals male-specific differences in molecular pathways related to oxidative phosphorylation between Iberian pig genotypes. *PLoS ONE* (2022) 17(8): e0272775. <https://doi.org/10.1371/journal.pone.0272775>

Benítez R, Núñez Y, Ayuso M, Isabel B, Fernández-Barroso MA, De Mercado E, Gómez-Izquierdo E, García-Casco J, López-Bote C and Óvilo C. Changes in Biceps femoris transcriptome along growth in Iberian pigs fed different energy sources and comparative analysis with Duroc breed. *Animals*. 2021; 11(12):3505. <https://doi.org/10.3390/ani11123505>

López-García A, Benítez R, Núñez Y, Gómez-Izquierdo E, de Mercado E, García-Casco J, González-Recio O, López-Bote C, Estellé J and Óvilo C. Influence of genetic background and dietary oleic acid on gut microbiota composition in Duroc and Iberian pigs. *Plos One* (2021) 16(5): e0251804. <https://doi.org/10.1371/journal.pone.0251804>.

Núñez Y, Radović Č, Savić R, García-Casco JM, Čandek-Potokar M, Benítez R, Radojković D, Lukić M, Gogić M, Muñoz M, Fontanesi L and Óvilo C. Muscle Transcriptome Analysis Reveals Molecular Pathways Related to Oxidative Phosphorylation, Antioxidant Defense, Fatness and Growth in Mangalitsa and Moravka Pigs. *Animals* (2021) 16;11(3):844. doi: 10.3390/ani11030844

García-Contreras C, Madsen O, Groenen MAM, Vazquez-Gomez M, Astiz S, Nuñez Y, Benitez R, Fernandez A, Isabel B, Rey AI, Gonzalez-Bulnes A, Óvilo C. Impact of genetic type, body weight and sex on the prenatal muscle transcriptome of Iberian pigs. *Plos One* (2020) 15(1): e0227861. <https://doi.org/10.1371/journal.pone.0227861>

Benítez R, Trakooljul N, Núñez Y, Isabel B, Murani E, De Mercado E, Gómez-Izquierdo E, García-Casco J, López-Bote C, Wimmers K, Óvilo C. Breed, Diet and Interaction effects on adipose tissue transcriptome in Iberian and Duroc pigs fed different energy sources. *Genes* (2019) 10, 589; doi:10.3390/genes10080589



Muñoz M, Bozzi R, García-Casco J, Núñez Y, Ribani A, García F, Škrlep M, Schiavo G, Bovo S, Utzeri VJ, Charneca R, Martins JM, Quintanilla R, Kušec G, Djurkin-Kušec I, Mercat MJ Riquet J, Estellé J, Zimmer C, Razmaite V, Araujo JP, Radović Č, Savić R, Karolyi D, Gallo M, Čandek-Potokar M, Fernández AI, Fontanesi L, **Óvilo** C. Genomic diversity, linkage disequilibrium and selection signatures in European local pig breeds assessed with a high density SNP chip. *Scientific Reports*. (2019)19;9(1):13546. doi:10.1038/s41598-019-49830-6.

Muñoz M, Bozzi R, García F, Núñez Y, Geraci C, Crovetto A, García-Casco J, Alves E, Škrlep M, Charneca R, Martins JM, Quintanilla R, Tibau J, Kusec G, Djurkin-Kusec I, Mercat MJ Riquet J, Estelle J, Zimmer C, Razmaite V, Araujo JP, Radović Č, Savić R, Karolyi D, Čandek-Potokar M, Fontanesi L, Fernández AI, **Óvilo** C. Diversity across major and candidate genes in European local pig breeds. (2018) *PLoS ONE* 13(11):e0207475. <https://doi.org/10.1371/journal.pone.0207475>

Benítez R, Fernández A, Isabel B, Núñez Y, De Mercado E, Gómez Izquierdo E, García-Casco J, López-Bote C and **Óvilo** C. Modulatory effects of breed, feeding status and diet on adipogenic, lipogenic and lipolytic gene expression in growing Iberian and Duroc pigs. *International Journal of Molecular Sciences* 2018, 19(1), 22; doi: 10.3390/ijms19010022

C.2. Congress

Óvilo C. Genetic and genomic association studies in Iberian pigs. XI International Symposium on the Mediterranean Pig. Vodice, Croacia, 2022. Invited talk

Óvilo C. Alternativas de empleo de marcadores moleculares en la mejora de la calidad del cerdo ibérico. IV Foro del cerdo Ibérico, Salamanca, 2022. Invited talk.

Óvilo C. Marcadores genéticos de calidad de la carne y el jamón. XX Congreso Mundial del Jamón. Segovia. 2022. Invited talk.

Óvilo C, Trakooljul N, Hadlich F, Murani E, Ayuso M, García-Contreras C, Vázquez-Gómez M, Núñez Y, Benítez R, Rey AI, González-Bulnes A, Isabel B, Wimmers K, Muñoz M. SNP discovery and association study for growth and fatness traits in crossbred Iberian Pigs. 38th International Society for Animal Genetics Conference, 2021. Oral communication.

Óvilo, C., Muñoz, M., Bozzi, R., García-Casco, J., Núñez, Y., Čandek-Potokar, M., Ribani, A., Schiavo, G., Bovo, S., Tinarelli, S., Gallo, M., Fernández, A.I., Fontanesi, L. y TREASURE CONSORTIUM. Análisis genómico y huellas de la selección en razas porcinas europeas. XIX Jornadas de Producción Animal, AIDA, 2021. Oral communication.

Óvilo C, Muñoz M, Bozzi R, García-Casco J, Núñez Y, Ribani A, Škrlep M, Quintanilla R, Mercat MJ Riquet J, Estellé J, Čandek-Potokar M, Fernández AI, Fontanesi L and TREASURE CONSORTIUM. Genomic analysis and selection signatures in local European pig breeds. X International Symposium on the Mediterranean Pig. Florencia, Italia, 2019. Oral communication.

Muñoz M, Bozzi R, García-Casco J, Núñez Y, Ribani A, Škrlep M, Quintanilla R, Mercat MJ, Riquet J, Estellé J, Čandek-Potokar M, Fernández AI, Fontanesi L, **Óvilo** C and TREASURE CONSORTIUM. Unraveling the genomic diversity and population structure of 20 autochthonous European pig breeds. 37th International Society for Animal Genetics Conference. Lérida, España, 2019. Oral communication.

J. Estellé, M. Čandek-Potokar, M. Škrlep, Čedomir Radović, Radomir Savić, D. Karolyi, K. Salajpal, M.J. Mercat, G. Lemonnier, J. García-Casco, P. Palma-Granados, R. Nieto, A.I. Fernández, B. Leuret and C. **Óvilo**. Gut microbiota analyses for sustainable European local porcine breeds: a TREASURE pilot study. 69th Annual Meeting of the European Federation of Animal Science (EAAP). Dubrovnik, Croacia, 2018. Invited talk.

Óvilo C, Bozzi R, García F, Núñez Y, Geraci C, Crovetto A, García-Casco J, Alves E, Škrlep M, Charneca R, Quintanilla R, Kusec G, Riquet J, Mercat MJ, Zimmer C, Razmaite V, Araujo JP, Radovic C, Savić R,



Candek-Potokar M, Fontanesi L, Fernández AI, Muñoz M. Diversity across major and candidate genes in European local pig breeds. 4th International Fatty Pig Conference. Badajoz, 2017. Invited talk.

Óvilo C. Employment of RNAseq technology for the understanding of metabolic and developmental processes in Iberian pigs. 6th CNAG Symposium on Genome Research. CRG, Barcelona, 2017. Invited talk.

C.3. Research projects.

National:

PID2019-108695RB-C31: Empleo de antioxidantes y PUFA en la dieta de cerdas ibéricas para optimizar la homeostasis metabólica e intestinal y la productividad de la descendencia. Plan Nacional I+D+I (2020-2022) 163.108 €. IP: Cristina Óvilo (IP subproject 1 and coordinator)

AGL2016- 79321-C2-1-R: “Factores individuales y nutricionales determinantes de la homogeneidad y los rendimientos en producción de cerdo ibérico”. Plan Nacional I+D+I (2017-2019) 175.000 €. IP: Cristina Óvilo / A González-Bulnes (coIPs subproject 1 and coordinators)

AGL2013- 48121-C3-3-R: “Structural and functional genomic factors influencing prenatal growth, postnatal development and meat production in Iberian pigs”. Plan Nacional I+D+I (2014-2016) 117.370 €. IP: Cristina Óvilo

AGL2010-21991-C03-02: “Nutrigenómica y adipogénesis en cerdo ibérico: Influencia del tipo genético, edad y nutrición en el control genético de la deposición de grasa intramuscular y subcutánea”. Plan Nacional I+D+I (2010-2013) 90.750 €. IP: Cristina Óvilo

International

Re-Livestock - Facilitating Innovations for Resilient Livestock Farming Systems. EU– H2020 (2022-2027) 540.000 €. IP: David Yáñez (CSIC).

HE FARM- Healthy environmental-friendly and resilient farm to fork. EU– H2020 (2022-2025) 333.000 €. IP: Rafael Blasco / Cristina Ovilo (coIPs INIA-CSIC)

TREASURE-634476- Diversity of local pig breeds and production systems for high quality traditional products and sustainable pork chains. EU - H2020 (2015-2019) 233,927€. IP: Cristina Óvilo (IP, deputy leader of WP1 and member of Quality Control Committee)

C.4. Contracts, technological or transfer merits

CON20-105 “Investigación de factores genéticos y nutricionales influyentes en la expresión de las capacidades máximas productivas y reproductivas de la raza ibérica. CDTI. INIA, IBERICOGEN (2020-2023). IP: Cristina Ovilo. 50.000 €

CON20-155 “Estudio de la nutrigenética aplicada al cerdo ibérico (NUTRIGEN)”. CDTI. INIA, Incarlopsa, UCM, UPM (2020-2022). IP: Cristina Ovilo. 57.200,00 €

Modificación del transcriptoma del cerdo mediante la nutrición para mejorar la grasa intramuscular del jamón curado (PIGOMICS). CDTI (FEDER-INNTERCONECTA). INIA, UCM, Incarlopsa, IBERCOM, Juan Jimenez S.A. (2015-2018) IP: Cristina Óvilo. 150.000 €



TRAINING PLAN

The student will be involved in all the activities planned for the coordinated Project and will enjoy the inter- and multidisciplinary environment provided by the consortium. The student will learn a wide repertoire of procedures and techniques and will have full access to all the resources and laboratory equipment to assure the completion of their PhD Thesis.

The research team has a strong background in the co-supervision of students in the frame of complex multidisciplinary studies and is committed to actively participating in the candidate's training. The education of students has always been considered a relevant task within our projects and it is of key importance for the motivation, coordination and scientific development of the groups. The student will have the opportunity to interact with researchers with very different backgrounds, allowing the acquisition of a global vision of the main aspects of pig production and research, including a wide and solid animal science, statistics, bioinformatics, laboratory and writing/presentation experience. Our system of co-supervision allows a very complete training in all areas, which supposes a great added value for the students' profit. Moreover, all students in our groups are encouraged to stay several months in outstanding scientific institutions where they can complete their training period and acquire new knowledge related to new techniques and approaches. Collaborations with other national and international research groups give an excellent opportunity for the student to interact and learn from an even wider scientific field. In this sense, the participants are part of national partnerships and international consortia, which favours the contacts for international visits. The INIA-CSIC team has recently started two new Horizon Europe projects (Re-Livestock and HE-Farm) which widen the collaboration network available for the students. In particular, the Re-Livestock Project involves a huge consortium with 37 partners and is focused on the implementation and optimization of strategies to improve resilience to heat stress in pigs and cattle, being thus connected to the subject of the present proposal.

The student will attend and present at INIA-CSIC's seminars and will be able to enroll in the CSIC's training program, with a wide offer of courses in many different disciplines. Also, the members of the research team participate as organizers/teachers in different courses and masters (Master en Producción y Sanidad Animal UPM-UCM, Master en Producción Porcina UCM-UNIZAR-Universidad de Lleida, Programa de Doctorado Facultad de Veterinaria) and this is an added advantage for potential students which have the opportunity to enroll in any of them. Moreover, they will attend international conferences, allowing them to learn about the latest advances in the field, expose their results to peer reviewing, and meet leaders in the same research areas. The planned activities also include the development of teaching and supervising abilities and the interaction with the animal production sector, which are skills that we consider essential for a mature researcher since we encourage our students to participate in scientific meetings as well as meetings with industry representatives, to stimulate communication skills at different levels. The advantage of our research, due to its mixed basic/applied orientation, is to offer the students the possibility of contacting and knowing the scientific environment as well as the porcine productive sector and its business environment, which may help them in accessing the professional market. Performing part of the experiments at the laboratory and part in contact with commercial farms, the student will have a better appreciation of what research involves but also what the swine industry needs, allowing them to identify those areas where further research and development is required so they can establish their future career.