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AYUDAS RAMÓN Y CAJAL CONVOCATORIA 2020

Turno RyC-INIA-CCAA

Nombre: ALVAREZ RODRIGUEZ, MANUEL
Referencia: RYC2020-028615-I
Área Temática: Ciencias agrarias y agroalimentarias
Correo Electrónico: manualvro@gmail.com

Título:

Modulation of female reproductive tract immune homeostasis by seminal extracellular vesicles

Resumen de la Memoria:

I obtained my PhD in 2013 University of León (ULE), Spain, in comparative animal reproduction. The main focus of my PhD was sperm cryobiology in domestic and wild species, using different sources (ejaculated or epididymal sperm), a different cryopreservation protocols: cryoprotectant choice, cooling and thawing rates, and antioxidant addition. The PhD included the participation in 4 research projects. I performed two research travels to the Zoological Society of London, UK (4 months) and to the University of Sheffield (2 months).

During my almost 4 year-long post-doctoral period at Linköping University, (LiU), Sweden, I developed two main research lines: (i) evaluation of semen, including DNA-intactness and proteomics of the seminal plasma, using advanced flow cytometry, cytokine analyses (Luminex and in-house ELISA), ICC and WB, and (ii) semen interaction with the immune system of the female, analysing RNA expression in the female genital tract in response to the entry of semen and/or seminal plasma, using microarrays platforms in mammals (porcine-model) and avian (chicken). I gained a Knut & Alice Wallenberg Foundation (Sweden) travel grant to University of Murcia, Spain (1 month, 2015) to work on epigenetics of cryopreserved pig embryos. Moreover, I gained a short-term fellowship, by the Japan Society for Promotion of Science, to acquire training in cloning advanced techniques using micromanipulation of murine gametes at the University of Yamanashi, Japan (5 months, 2017). I was participant in 7 research projects (3 of them as PI; granted sum: 85.000). I am an honorific collaborator of University of Leon from 2017 to date, and I have a fruitful collaboration with the Department of Animal Science, College of Agriculture, University of Tabriz, Tabriz, Iran (5 publications as last author).

From April 2018, I was supported by a Juan de la Cierva Incorporación at Autonomous University of Barcelona (UAB), to increase my expertise in sperm cryobiology and proteomics in wild species as well as male-female interaction in a different mammal (rabbit)-model. I am collaborator in 3 projects MICINN, Spain and I gained, as PI, an excellency project FORMAS, Sweden, entitled The immunological paradox of pregnancy and embryo mortality in pigs, where does it start? (granted sum: 300.000 - 2020-2022). The main focus was to map the expression changes in immune-related genes relevant for the establishment of an adaptive state of maternal immune tolerance are temporally signaled by specific tolerogenic cytokines or small RNAs present in exosomes delivered in SP at mating or A. Finally, the relation between these signals with semen and embryo quality and prolificacy should allow to develop diagnostic tools to screen males and females for optimal potential fertility when using breeding biotechnologies.

Currently, I am senior researcher at UAB, with the JIN (Jóvenes Investigadores) project, entitled: Modulation of female genital immune homeostasis by seminal exosomes: a conserved role for fertility? (granted sum: 169.400 - 2020/12/01 - 2023/11/30). The main focus of my research line is to determine the signaling roles of seminal fluid/plasma exosomes and their cargo of smallRNAs on fertility-proven rabbit, pig and chicken in eliciting changes in the expression of immune process-related genes by the epithelia of female sperm storage sites.

Resumen del Currículum Vitae:

I am a Biologist (University of León, Spain, 2007) with experience in the field of animal reproduction (PhD, University of León, Spain, 2013), including the application of different laboratory techniques such as flow cytometry (FC) for comparative studies on cryobiology of gametes in domestic and wild species, resulted in the publication of 5 articles (+9 collaborations) SCI-indexed Journals. I performed two research travels to the Zoological Society of London, UK (4 months) and to the University of Sheffield (2 months).

During my almost 8 years in total of postdoctoral experience, I have performed my research work in 2 international universities (University of Linköping, Sweden and University of Yamanashi) and 2 national universities (University of Murcia, and Autonomous University of Barcelona (UAB)). In addition, I had a fruitful collaboration both international (University of Tabriz, Iran; (5 articles as last author)) and national (University of Extremadura, University of León (honorific collaborator) and INIA, Madrid).

During my first postdoc, I joined Linköping University, Prof. Heriberto Rodríguez-Martínez, at the Faculty of Health Sciences, with focus on comparative cryobiology of sperm and oocyte/embryos (boar, human and chicken), mapping exosomes markers, cytokines (ELISA & LUMINEX); RNA isolation and transcriptomics (microarrays), and proteomics (WB, ICC, IHC), related to female response, immune reaction,



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to the entrance of sperm (and seminal plasma), resulted in the publication of 34 articles during my postdoctoral position. I had a scholarship at University of Murcia, Spain to work on epigenetics of vitrified porcine embryos (May 2015) and also had a Japan Society for Promotion of Science-fellowship in micromanipulation of embryos in University of Yamanashi, Japan (February-June 2017). I have supervised 10 students (master and PhD temporary stay). I had an active participation in 13 research projects based in Spain and Sweden: 3 of them as PI Sweden (granted sum: 385.000) and 3 of them as co-applicant (including one Sweden-Bangladesh).

Then, I had a Juan de la Cierva-Incorporación contract (granted sum: 64.000) at UAB, Prof. Manel López-Béjar research group, focused on the rabbit model, resulted in the publication of 5 articles. Co-supervisor of 2 PhD students (Jaume Gardela and Mateo Ruiz-Conca).

Currently, I am senior researcher at UAB, with the JIN (Jóvenes Investigadores) research programme (granted sum: 169.400 - 2020/12/01 2023/11/30).

I have published a total of 60 articles (JCR indexed, 38 Q1, 17 Q2 (1/3); 43 as first, second, corresponding or last author). I have 2 articles as first and last author in top journals in the multidisciplinary area (Nature Scientific Reports, PLoS ONE). My h-index is 18 and my i10 index is 25, based on 882 citations (130 cites/year, 2016-2020). I participated in 62 abstracts (including plenary, workshops and oral communications) in international and national meetings (Spermatology, European and Spanish Associations of Animal Reproduction, Cryobiology and Human Reproduction and Embryology). I have the accreditation for "Profesor Ayudante Doctor", "Profesor Contratado Doctor" (ANECA), and Excellence Research I3 (2019). Finally, I have largely participated in teaching, bachelor and master level, at Linköping University (Medicine and Medical Biology) and UAB (Veterinary Medicine).



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Nombre: ALMAGRO BONMATI, MARIA
Referencia: RYC2020-029181-I
Área Temática: Ciencias agrarias y agroalimentarias
Correo Electrónico: mbonmati@cebas.csic.es

Título:

Managing Mediterranean agroecosystems to successfully contribute to climate change mitigation and adaptation and to the delivery of ecosystem services

Resumen de la Memoria:

With a PhD in Soil Sciences and Agronomy (2011) I have worked at different prestigious research institutes. Since 2019 I hold a postdoc at the Spanish Research Council (CEBAS-CSIC) and I am an associate researcher fellow at the Basque Centre for Climate Change-BC3.

I pursue applied research to propose sustainable agricultural practices that increase the resilience of agroecosystems to climate change in order to align profitable agriculture with soil conservation and climate change mitigation and adaptation. To do it so, I combine observational and experimental studies with modelling to predict and understand:

- 1) the contribution of sustainable land management (e.g., conservation agriculture, crop diversification, vegetative buffer strips, agroforestry, water harvesting techniques) to climate change mitigation and adaptation and to the delivery of multiple ecosystem services (e.g., food provision, erosion control, carbon sequestration, fertility maintenance) at the farm and landscape level; and
- 2) the carbon fluxes from terrestrial ecosystems, and their response and feedbacks in relation to global environmental changes and disturbances, such as climate change, increased solar UV radiation, soil management, and erosion.

This work has been carried out through multi/interdisciplinary frameworks under the umbrella of competitive/commissioned R+D Sci. projects, for which I have contributed to rise funding, or through several competitive grants and scholarships I have been awarded with, including the Juan de La Cierva-Incorporación Fellowship, one of the most competitive grants at Spanish level (success rate under 10%) that recognizes the most promising early career researchers. Most of my work has been published in high impact journals and has intended to yield applicable outputs that can be relevant for policy making, stakeholders involved in the agricultural sector and society in general (e.g., UNEP Environmental Effects Assessment Panel, member of EU-EIP Agri Focus group, member of Working Group on SOC Management of FAO).

Networking with modellers and other disciplines (e.g. economists) has been also key. I have managed and mentored PhD (5), MSc (1) and BSc (1) Students as well as trained research assistants (4).

Resumen del Currículum Vitae:

I am a soil ecologist and biogeochemist with leading experience in the field of soil carbon fluxes in natural and agricultural Mediterranean ecosystems, with particular interest in soil respiration, carbon sequestration mechanisms, plant residue decomposition, soil water erosion and sediment dynamics. I combine observational and experimental studies with modelling to investigate the impacts of changes in climate, land use and land management on soil and water resources and their associated ecosystem services. I pursue applied research to propose sustainable agricultural practices that increase soil health and mitigate climate change, as for example the study of conservation tillage and regenerative agriculture, crop diversifications, and vegetative buffer strips. I engage with the international scientific community, public administrations and practitioners and try to disseminate the outcomes of my research at the local, regional and global scales through blog-posts, leaflets, press releases, scientific papers and technical reports oriented to policy makers, stakeholders, farmers and society. My ultimate interest is to understand the effects of ecosystem degradation on ecosystem functioning while finding ways to align profitable agriculture with soil conservation and climate change mitigation and adaptation.

Most of my career has been funded almost exclusively through competitive funding schemes including 2 undergraduate fellowships, 2 postgraduate fellowships, 1 PhD fellowship, and the JdC-Incorporation fellowship. I acted as PI of the research funds accompanying the JdC-Incorporation fellowship (6,000 €). I conducted my PhD at the Soil and Conservation Research Group from CEBAS-CSIC. My pioneer work in semiarid Mediterranean ecosystems resulted in 4 publications in some of the top-ranked high-impact journals in Soil Sciences. One of my papers has been highly cited in Scopus and highlighted once in Science. I have 3 years of international pre-doctoral experience (University of Bayreuth, Germany; University of Aveiro, Portugal; Ohio State University and University of Kentucky, USA; Univ. of Edinburgh, UK) and 1.5 year of international postdoctoral experience (Catholic University of Sacred Heart, Italy). I have worked for 5.5 years as a postdoctoral researcher in several prestigious research centres other than that where I did my PhD (BC3-Basque Centre for Climate Change, MNCN-CSIC, Catholic University of Sacred Heart). I have had the opportunity to work in a wide variety of biomes spanning from tropical to temperate systems, as well as across different scales (from local to global analyses) through my participation in 30 projects related to carbon and water fluxes in agricultural and natural ecosystems under different climatic conditions conducted by different universities and research institutes in Europe. I participated in 3 European COST Action networks related to Arid Lands Restoration, Climate



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Change Experiments, and Intermittent Rivers Management. Since 2012, I actively participate in a national network (RED REMEDIA) related to climate change mitigation in the agroforestry sector. I also act as expert advisor on soil management for the local farmer association Alvelal and for the Commonland Foundation. I am an elected member of different international Expert Panels (Working Group on Soil Organic Carbon Management of FAO, Focus Group Moving from source to sink in arable farming of the European Innovation Partnership).



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Nombre: NUÑEZ PINEDA, MONTSERRAT
Referencia: RYC2020-029420-I
Área Temática: Ciencias agrarias y agroalimentarias
Correo Electrónico: montserrat.nunez@irta.es

Título:

Decision support tools for environmental sustainability of agrosystems

Resumen de la Memoria:

I am a researcher in the field of environmental sustainability of agri-food systems. My main research line is the provision of decision support tools for environmental sustainability of agrosystems, with a focus on consideration of environmental problems related to resource use and emissions in agrosystems. I have specialized in developing and applying large-scale, quantitative models to assess the environmental performance (environmental footprint, EF) of agri-food systems as the basis to identify solutions to reduce environmental impacts of food production and consumption. I have a BSc degree in environmental sciences (2004, Autonomous University of Barcelona, UAB, Spain), a MSc in environmental sciences and technology (2006, UAB) and a PhD in environmental sciences and technology (2011, European Mention, UAB). My PhD focused on developing models to assess environmental impacts of land and water use in agriculture and applying them to bioenergy crops grown in Spain. Over my career, I sought broadening my experience and capacities via international mobility. I worked at research centres in Spain, France and Germany and did secondments in Argentina and Switzerland. Furthermore, I have actively engaged in highly relevant international scientific activities steered by global (United Nations) and European (European Commission) public bodies and led international expert working groups. Beyond the scientific impact of my research, it also has important political and societal impacts via its integration into the European EF initiative and consequent agricultural and environmental policies. In 2019, I joined IRTA with a Beatriu de Pinós transnational fellowship. At IRTA, I expanded my initial focus on environmental impact modelling of resource use in agriculture to also cover environmental impacts of emissions. Furthermore, I am principal investigator of a project, leading private research contracts and planning and writing competitive proposals. I am a prolific scientist publishing in highly ranked journals. My h-index is 17. Around 90% of the publications are published in decile 1 journals, 1/3 of which I am first author. I co-supervised 3 PhD theses and many visiting young scientists. My current scientific interests focus on exploring the potential environmental benefits of emergent regenerative and agro-ecological practices in agriculture compared to conventional agriculture via development and application of a comprehensive set of EF indicators with a focus on soil health, ecosystem services, biodiversity, and carbon sequestration.

Resumen del Currículum Vitae:

I am a researcher in the field of environmental sustainability with a BSc degree in environmental sciences (2004, UAB), a MSc in environmental sciences and technology (2006, UAB) and a PhD in environmental sciences and technology (2011, European Mention, UAB). In my PhD, I demonstrated high creativity and innovative skills by developing and applying to crop rotations pioneer methods to account for the environmental performance (environmental footprint, EF) of agricultural systems. I focused on models for soil erosion, desertification, and freshwater use impacts, which are environmental impacts until then omitted in EF methods. During my PhD, I was awarded a grant to go on secondment to UTN (Argentina) and ETHZ (Switzerland) to jointly develop the desertification and the freshwater use models. After my PhD, I worked at research centres and universities in France (IRSTEA, INRA), Spain (IRTA), and Germany (Technical University of Berlin). During these postdoctoral positions, I focused on furthering the scientific quality of EF models and their suitability for use in agri-food systems, while paying attention to their operationalization. In 2019, I joined IRTA with a transnational Beatriu de Pinós post-doctoral individual grant. Over my career, I have shown i) a continuous record of international mobility and active engagement in highly relevant international scientific activities steered by global and European public authoritative bodies; ii) an increasing expertise in developing global scale, quantitative, EF models and using them as decision support tools for improving environmental sustainability of agrosystems. As a result, I have become a reference scientist leading global working groups (United Nations) and being elected for focus groups of the European Commission (EIP-AGRI). Taking on forefront responsibilities has strengthened my scientific leadership, project management skills and helped me to build a strong international network. I supervised 3 PhD theses and many visiting young scientists. I am a prolific scientist, with 30 peer-reviewed scientific articles and 2 book chapters. Publicly funded scientific production is freely available in Europe through the data repositories of the research centres I have worked. According to Scopus, 28 articles are published in Q1 and 26 in D1. From the latter, I am first author in 8. Two of the articles are in the top 30 and 60 cited articles of all times in the journal (publishing from 1997). I have an h-index of 17. The book chapters accumulate 143,000 downloads each. Moreover, I have been an invited speaker at international conferences, chaired conference sessions and was elected as member of the scientific committee of the most relevant conference internationally in the field of agriculture and EF methods. Currently, I am coordinating an EIP-AGRI operational group, leading private research contracts and co-managing the planning and writing of H2020 European projects. I am conducting my own research in collaboration with institutions worldwide and addressing a wide range of issues associated with the environmental performance of agricultural systems. My current scientific interest focuses on the emerging field of regenerative and agro-ecological practices and



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development of EF indicators that comprehensively assess their environmental pros and cons as compared to conventional practices.