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AYUDAS RAMÓN Y CAJAL
CONVOCATORIA 2019

Turno RyC-INIA-CCAA

Nombre: RAMAYO CALDAS, YULIAXIS
Referencia: RYC2019-027244-I
Área Temática: **Ciencias agrarias y agroalimentarias**
Correo Electrónico: yuliaxis.ramayo@irta.cat

Título:

Metagenomics and integrative biology tools to improve sustainable livestock systems

Resumen de la Memoria:

Throughout my scientific career, I have worked in several world-class international research institutions and collaborated with researchers with different scientific backgrounds. These circumstances have allowed me to gain broad research expertise and skills in animal genetics, genomics, metagenomics and computational biology.

The main objective of my PhD thesis was the identification of genetic markers and gene networks associated with the intramuscular fatty acids profile in pigs. To accomplish this goal, we employed different but complementary statistical methods evolving from reductionism towards implementing holistic integrative approaches. I defended my PhD in July 2013. This same year, I was awarded a Marie-Curie FP7 COFUND post-doctoral fellowship to join the Institut National de la Recherche Agronomique (INRA). My research activity in this period addressed the generation of metagenome reference catalogues of the porcine gut and the bovine rumen microbiomes. As a result, I co-authored the first reference gene catalog of the pig gut microbiome, a new version of the rumen metagenome catalog and implemented a system biology approach to infer microbial interaction networks. In 2014, I was recruited as a junior research scientific at the Bovine Genetics and Genomics team (INRA). During this period, I have led two projects on the adaptation of cattle to tropical conditions and the relationship between the rumen microbiota and methane emissions.

In 2017, I joined IRTA with a second Marie Sklodowska-Curie award. The main goal of the project is to implement an analytical framework to integrate multi-level omics data for the prediction of feed efficiency in pigs. As a result of the project, we propose a panel of genetic markers that can be used to predict feed efficiency in commercial populations of pigs, which open the possibility of a more accurate selection process of feed efficiency, and therefore, contribute to the sustainability of the porcine industry. Currently, I am coordinating a project funded by the Spanish RDI Programme Retos Investigación (AGL2017-88849-R), aiming at deciphering the joint contribution of gut microbiota and host genetics to efficiency, behavior and robustness in pigs. This project strengthens my scientific management abilities, and will contribute novel knowledge of the mechanisms involved in the interaction between the digestive microbiota, the host genotype and their relationships with socio-economical relevant traits.

My immediate and future interests are strongly oriented to follow and consolidate the research line based on the emerging fields of metagenomics and integrative biology applied to livestock production. I am strongly motivated and convinced that I will be able to contribute and lead research on this field, employing and developing new methodologies based on holistic approaches that combine multiple sources of information (phenomics, genomics, transcriptomics and metagenomics) and their translation into new tools for a more efficient and sustainable livestock breeding programs. Thus, I will contribute to the sustainable development of agriculture and livestock production systems. In this sense, my research line will also help and complement transversal research actions to boost microbiome assessments in ongoing and future research actions, including different agrosystems and the environment.

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Resumen del Currículum Vitae:

I am an enthusiastic, highly motivated and active researcher. Throughout my scientific career, I have shown a consistent record of high-mobility and experiences in different areas related to Animal Sciences. I am a Veterinarian (2006, UDG, Cuba), obtained a MSc in Animal Breeding and Reproduction Biotechnology (UPV-AUB, 2008) and a PhD from Universidad Autónoma de Barcelona in 2013. My PhD work focused on identifying genetic markers and gene networks associated with the intramuscular fatty acids profile in pigs. During that period, I got a four months mobility grant to receive an Industrial Traineeship in System Biology at CSIRO (Australia).

After my PhD dissertation, I was awarded a post-doctoral Marie-Curie FP7 COFUND Programme to join the Institut National de la Recherche Agronomique (INRA, France). The main goal of the post-doc was to develop the reference gene catalogue of the pig gut and the bovine rumen microbiomes within a project involving INRA, UCPH (Denmark) and BGI (China). In 2014, I was recruited as a junior research scientific at the Bovine Genetics and Genomics team (INRA). During this period, I have led two projects on the adaptation of cattle to tropical conditions and the relationship between the rumen microbial ecosystem and methane emissions in cattle.

In 2017, I joined IRTA with a second Marie Sklodowska-Curie award to develop a project focusing on the integration of omics data for the molecular-based prediction of feed efficiency in pigs. Currently, I am coordinating a project funded by the Spanish RDI Programme Retos Investigación (AGL2017-88849-R), aiming at deciphering the joint contribution of gut microbiota and host genetics to efficiency, behavior and robustness in pigs. My research activity addresses a wide range of topics (Genetics, Genomics, Transcriptomics, Metagenomics and Computational Biology) across different animal species such as mice, pig, rabbit, horse and cattle. Since 2010, I have published 37 peer-reviewed scientific articles, 23 of them as first (11), second (8) or last (4) author. According to the Web of Science Core Collection (January, 2020), 30 of my articles gather 783 citations, 36 are published as open access in Q1, and I have an h-index of 15. Among my scientific contributions, I highlight (i) the first map of copy number variants in pigs based on whole-genome SNP data, (ii) the first reference gene

catalogue of the pig gut microbiome, (iii) the identification of predictors and candidate genes associated with feed efficiency in pigs, (iv) the identification of a causative mutation for muscle fiber-type and intramuscular fat content in pigs, (v) two methodological developments to infer microbial interactions networks, and a R package to integrate multi-omics datasets focused on the integration of microbial ecosystems.

I am co-supervising two PhD students, I collaborate with world-class international research institutions within the frame of two European projects. I am leading my own research through the co-coordination of multi-disciplinary projects in two different institutions (INRA and IRTA), which reflects my scientific leadership and management capacity. My immediate and future scientific interests focus on the emerging fields of metagenomics and integrative biology and turning them into new tools applied to a more efficient and sustainable livestock production systems.

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Nombre: NAVARRO CANO, JOSE ANTONIO
Referencia: RYC2019-026848-I
Área Temática: **Ciencias agrarias y agroalimentarias**
Correo Electrónico: janavarro73@hotmail.com

Título:

Plant-soil interactions and ecological restoration

Resumen de la Memoria:

My research line deals with the ecological restoration of plant-soil interactions in degraded forests, abandoned fields and mining areas. I ve integrated in research groups in Spain, Austria and Sweden. Drinking from diverse scientific sources has allowed me to incorporate the role of different biological interactions (plant-plant, plant-animal, and plant-soil microbe) to the assessment of ecosystem services under a global change scenario, as well as design restoration tools to cope with the loss of soil fertility, biodiversity and functionality in drylands.
During my Ph.D. at CEBAS-CSIC (2003-2007; supervisors: Dr. Ing. V. Castillo and Dr. G.G. Barberá), I was trained as a plant-soil scientist with a main focus on environmental restoration of semiarid areas threatened by desertification. We used environmental heterogeneity and inter-specific interactions to improve plant and soil conditions. We also empirically assessed the success of old pine afforestations to restore plant diversity and soil fertility. Likewise, I demonstrated the effect of semiarid pine plantations on the establishment of wild plant. Within the EU project RECONDES I collaborated with J. Poesen (Belgium) to rank plant species according to their root characteristics and erosion-reducing potential. I also led a work package in the demonstrative EU-LIFE project JARA, in which an old mine and the adjacent metal waste area were restored.
My postdoct experience in two international institutions spans through 42 months. In my 1st stay at the University of Innsbruck (Austria) (2008-2009), I participated in a project led by Prof. Dr. B. Erschbamer and funded by the Austrian Science Fund to assess the effects of global warming on grasslands. In this research, we demonstrated the importance of regeneration functional traits governing species turnover and the role of the temperature in the germination stage along altitudinal gradients on glacier forelands. In my 2nd postdoc at the University of Stockholm (Sweden) (2010-2011) I worked under the supervision of Prof Dr. J. Ehrlén. I assessed the effects of the ongoing climate change on the feeding interaction of two phytophagous insects on several Cruciferae plant species. The project fitted in the larger framework of the Swedish research program EKOKLIM.
In 2012, I went back to CEBAS-CSIC to work for a year in the group of Prof. Carlos García Izquierdo through a private contract with Ecosur Laboratories. With him I had the opportunity to start studying the role of pioneer plants on the provision of different ecosystem services related with soil fertility and soil microbial productivity in depleted agroecosystems as semiarid gypsum lands prone to desertification.
Since mid 2013, I am a postdoctoral researcher at the CIDE-CSIC (Valencia), where I work with Prof. Miguel Verdú. I am currently doing a stay (since 16 months) at INIA collaborating with Dr. Marta Goberna. I have focused my research in assessing how plant-soil interactions determine ecosystem functioning and services in abiotically stressed ecosystems, and how facilitative interactions can be applied to the design of soft tools for soil rehabilitation and ecological restoration. I have also transferred knowledge to six public and private institutions through leading local restoration projects during which I managed 182.264 euros of private and public funding.
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Resumen del Currículum Vitae:

I am a mid-career researcher devoted to the ecological restoration of the plant-soil interface in degraded ecosystems (mainly drylands). I have been involved in 23 R&D projects and contracts on forestry assessment, restoration of ecosystem services and ecological applications to pilot restoration programs.
Scientific and technical contributions. I have published 28 SCI articles on plant science, soil science, forestry and ecology, with impact factors from 1.031 to 10.689 (10 SCI in Top 10 in their fields). I have also (co)authored an international book and seven international book chapters. I am the main author of a manual on ecological restoration edited by CSIC. I have also published 24 peer-reviewed articles, national books, chapters and dissemination articles, and 13 scientific-technical reports. I am the first or senior author in most of my contributions. I have participated with 39 contributions to scientific meetings (21 in international congresses), including 4 invited and 15 oral communications.
Mobility and international activity. During my career, I have worked in four national (Murcia, Valencia and Madrid) and two international research groups. I accumulate 42 months of postdoctoral experience in Austria (Universität Innsbruck) and Sweden (Stockholms Universitet), from which I published 7 SCI papers. I have participated in 7 international projects, including funding from the EU-LIFE and EU-Proder programmes, the Autrian Science Fund, the Swedish Science Academy, and international scientific societies. I have been lecturer in three master courses in Spain and Sweden. As a reviewer I have revised manuscripts for 18 SCI journals and I am a guess editor in Forests.
Leadership. As Principal Investigator, I have managed 182.624 including public (2 EU-LIFE and 1 EU-PRODER) and private funds (British Ecological Society, Fundación Caja Murcia Bankia and Fundación sierra Minera). I am currently co-supervising a PhD student and I have supervised 8 other students in three institutions, including 5 Master Thesis and 2 Degree thesis. I have organised two scientific workshops on restoration, funded by the Fundación BBVA. I have been actively involved in the transference of knowledge on forest management and restoration, as the scientific advisor of two public agencies (22 months), a spin-off company (12 months) and two private foundations (21

months). This activity was funded through four R&D contracts, in which I led the execution of three pilot projects, was author of nine scientific-technical reports and seven documents for the dissemination of scientific results to the general public.
https://www.researchgate.net/profile/Jose_Navarro_Cano
https://scholar.google.es/citations?hl=es&user=WAXhs3IAAAAJ&view_op=list_works

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Nombre: MONTERO CALASANZ, MARIA DEL CARMEN
Referencia: RYC2019-028468-I
Área Temática: **Ciencias agrarias y agroalimentarias**
Correo Electrónico: montero.calasanz@gmail.com

Título:

Bioprospecting of soil bacteria for their use as bioinoculants for sustainable agriculture and restoration of soil fertility

Resumen de la Memoria:

Dr. Montero-Calasanz is a lecturer in the School of Natural and Environmental Sciences at Newcastle University (UK) with more than 14 years' experience investigating bacterial diversity and plant-microbe interactions in agricultural and degraded ecosystems. She has a strong background in bioprospecting of plant-growth promoting bacteria; microbial systematic; phylogenomics; functional and comparative genomics ((meta)genome analysis and (meta)transcriptomics); and formulation, application, and monitoring of bacteria-based bioinoculants. Her research interests and trajectory are focused on agro-ecological role of soil bacteria from agro-, arid- and degraded ecosystems in relation to soil microbial community, soil formation and erosion, and management of soil-plant-microbe system aiming to exploit their biotechnological potential as bioinoculants for sustainable agriculture and restoration of soil fertility.
Her international career has fostered strong long-term synergies and the authorship of 71 scientific publications (51 SCI papers, 1 book, 7 book chapters and 1 R package user manual; 17 SCI papers as the First Author and 20 as the Corresponding Author; 7 Q1) including co-authors across more than 10 different countries; 2 in the Best cited papers list of IJSEM (March 2014-Feb 2015); Research Excellence Framework (REF) 2021 cases: four cases of 3*; participation in 14 national and international funded research projects; currently PI in 1 UK funded research project (IAFRI/Fera Science Ltd), Co-PI in two funded by public research councils BSRC and EPSRC, and team member in 1 Spanish funded research project (RETOS) and 4 USA publicly funded research projects; PI of two past funded research projects and officially involved in 4 more funded by national and international public research bodies; PI in Total attracted direct funding in the last 3 years: >422,000 (including £21, 250 in infrastructure); supervision of 3 PhD students, 4 MSc and 23 bachelor degree projects; Author of 28 works submitted to national and international conferences (7 Oral Communications, 3 as an invited speaker, 1 conference chair); invited speaker in Seminar series of University of York (UK) and Willobog Bonsai Farm (UK);HEA fellow (equivalent to ANECA accreditation Profesor titular); Academic Leader of 2 10 credit UG modules; teaches in 12 UG and PG modules; Progression panel member of 7 ongoing doctoral thesis; Member of a thesis committee at University of Seville (Spain); Supervisor of 7 UG placement, 7 guest international PhD students and 1 research visitor; Predoctoral Internships in Germany and Canada; External Reviewer for public research bodies (Argentina; ANPCyT) (2017 and 2018); Reviewer in Bergeys manual (Wiley), Springer books and 12 SCI journals; Freelance reviewer in Pearson editorial; Guest editor in IJERPH; Tutor of 32 UG and PG students; Recognition Good Labour Practice by IFAPA; Recognised Academic expert in N8 Agrifood Crop and Soil Innovation pipeline; Management positions: Curator of culture collection of SNES and Responsible of academic integrity (2015-2018) in Newcastle University; Senior developer of R packages (Opm and Lethal); Lectureship Promotion from F to G grade in 2017; Organiser of Newcastle Actinomycetes Group meetings (NU/Northumbria University), pre-conference workshop (Italy) and an International Symposium (UK);
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Resumen del Currículum Vitae:

Dr. Montero-Calasanz is a lecturer in the School of Natural and Environmental Sciences at Newcastle University (UK) with more than 14 years' experience investigating bacterial diversity and plant-microbe interactions in agricultural and degraded ecosystems. She has a strong background in bioprospecting of plant-growth promoting bacteria, microbial systematics, phylogenomics, functional and comparative genomics ((meta)genome analysis and (meta)transcriptomics), and formulation, application, and monitoring of bacteria-based bioinoculants. Her research interests and trajectory are focused on agro-ecological role of soil bacteria from agro-, arid- and degraded ecosystems in relation to soil microbial community, soil formation and erosion, and management of soil-plant-microbe system aiming to exploit their biotechnological potential as bioinoculants for sustainable agriculture and restoration of soil fertility.

Her international career has fostered strong long-term synergies and the authorship of 51 indexed papers including co-authors across more than 10 different countries; participation in 14 national and international research projects funded through public competitive calls; currently PI in 1 UK funded research project (IAFRI/Fera Science Ltd), Co-PI in two funded by BSRC and EPSRC, and participates as a team member in 1 Spanish funded research project and 4 USA funded research projects; PI of two past funded research projects and officially involved in 4 more funded by national and international public research bodies; supervision of 1 PhD student, co-supervision of 2 PhD students, and supervision of 4 MSc and 23 bachelor degree projects; HEA fellow; leader of 2 UG modules; teaching in 12 modules; Editor in IJERPH; Curator of PMBRG Culture collection; 5 REF2021 cases scored as 3* by the internal quality assessment panel; external R&D project evaluator; Freelance reviewer; reviewer in 12 Journals; recipient of 4-year predoctoral FPI, 1-year Postdoctoral contract awarded by IFAPA, and 2-year Postdoctoral contract awarded by Leibniz Institute-DSMZ in public competitive call;Frequent participant of European Researchers Night (Germany), University Open days (UK), Tell and Show (UK) events, Feria de la Ciencia (Spain); Advisor in spreading projects IGEM competition (2018, 2019); 3 official cooperation agreements with private companies;

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h-Index= 13, Citations: >566. Source: Web of Science.