Neurobiology of Dementias

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DESCRIPTION

This multidisciplinary team is made up of more than 40 researchers including neurologists, neuropsychologists, biologists, biochemists, engineers and laboratory technicians. This is a highly translational team combining basic research with clinical research in humans to advance our understanding of these diseases. The group is very productive in generating publications and attracting competitive resources. The group regularly trains national and international residents, Master's students and pre- and postdoctoral researchers. The group offers an excellent place for the training of young researchers in a unique translational environment.

MAIN LINES OF RESEARCH

- Identification and characterization of novel biomarkers for the diagnostic and prognostic evaluation of patients with neurodegenerative diseases.
- Understanding the natural history of Alzheimer's disease clinical and biomarker changes in people with Down syndrome.
- Understanding the genetic causes underlying neurodegenerative disorders and developing new genetic-based biomarkers to aid in disease diagnosis and prognosis.
- Characterizing the molecular mechanisms underlying neurodegenerative dementias.
- Digital neuropathology applied to neurodegenerative diseases.
- The intersection between sleep, epilepsy, and Alzheimer's disease.

- Clinical trials in Alzheimer's disease and Down syndrome.

SCIENTIFIC CHALLENGES

Since its founding over 15 years ago, our group has experienced continual and exponential growth and is firmly consolidated as a leader in translational research into neurodegenerative dementias. We currently have a total of 11 principal investigators of active, competitive research grants. Although this is a positive sign of our growth in recent years, it also brings with it many organizational challenges that need to be met. Within our research setting, our group is a relative exception not only in size but also in the levels of clinical care and scientific excellence achieved. Moving forward, our objective is to maintain a sustainable growth without compromising on the values and vision that we have sustained until now and that have made this growth possible.

Recent advances in the field of Dementia are expected to herald a revolution in the coming years that will have a substantial impact on our clinical and research activity. For example, digital tools and plasma biomarkers are already here and pharmacological treatments that change the course of Alzheimer's disease could be available in the next 24 months. The detection of low abundant proteins in plasma requires ultrasensitivity, such as that provided by Single Molecule Array (SIMOA) digital ELISA technology (Quanterix), which is available in our group. Combined with our active participation in multiple clinical trials, our group is perfectly placed to lead the charge in this field and adapt to these changes.

Based on the aforementioned advances, the challenges moving forward include:

- Maintain our scientific production and funding, prioritizing the projects with higher impact.
- Consolidate our number of granted projects in European and international applications.
- Unfold the potential to collaborate with pharma and technological companies to foster additional patent applications and contracts.
- Adapt our research in response to the integration of the first disease-modifying therapy.
- Continue to innovate by developing ever more sensitive technologies for digital and blood based biomarkers.

ACTIVE GRANTS

- Alcolea Rodríguez, Daniel Andrés. Utilidad diagnóstica de Aβ42 y Aβ42/40 en LCR y plasma para detectar amiloidosis cerebral y correlación con marcadores subrogados de producción de β-amiloide en enf. de Alzheimer. PI18/00435. Instituto de Salud Carlos III (ISCIII). Duration: 2019-2023. 147.620,00 €.
- Alcolea Rodríguez, Daniel Andrés. Caracterización multimodal de las etapas prodrómicas del espectro Alzheimer-Lewy. PI22/00611. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2025. 153.670,00 €.
- Alcolea Rodríguez, Daniel Andrés. Technology validation of full automated plasma assay based on the chemiluminescence immunoassay technique for the 4 biomarkers, b-amyloid 42/40, t-Tau, p-Tau181 and Neurofilament light in Alzheimer's disease. PNC00126. SYS-ALZ-2022-01. Non competitive. Sysmex Inostics GMBH. Duration: 2022-2023. 51.750,00 €.
- Arranz Martinez, Javier Jose. Contractes Rio Hortega 2021. CM21/00243. Instituto de Salud Carlos III (ISCIII). Duration: 2022-2023. 65.000,00 €.
- Arriola Infante, Jose Enrique. Contratos Rio Hortega 2022. CM22/00219. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2024. 65.000,00 €.
- Bejanin, Alexandre Pierre Armand. Contractes Miguel Servet I 2020. CP20/00038. Instituto de Salud Carlos III (ISCIII). Duration: 2021-2026. 202.500,00 €.
- Bejanin, Alexandre Pierre Armand. Neuroimagen multimodal de la enfermedad de pequeños vasos relacionada con la enfermedad de Alzheimer en el síndrome de Down. PI22/00307. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2025. 165.770,00 €.
- Bejanin, Alexandre Pierre Armand. Multimodal imaging of small vessel disease in genetic AD. AARG-22-923680. Alzheimer's Association. Duration: 2022-2025. 126.532,76 €.
- Carmona Iragui, Maria. Estudio de biomarcadores bioquímicos y de imagen de angiopatía amiloide cerebral en el continuum de la enfermedad de Alzheimer esporádica y asociada al síndrome de Down. PI18/00335. Instituto de Salud Carlos III (ISCIII). Duration: 2019-2023. 68.970,00 €.

- Carmona Iragui, Maria. Caracterización de la epilepsia y de los trastornos de sueño en la enfermedad de Alzheimer esporádica y asociada al síndrome de Down. PI22/00785. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2025. 135.520,00 €.
- Carmona Iragui, Maria. Inflammatory biomarkers along the Alzheimer's disease continuum in down syndrome. JLF 2020 M CARMONA. Jérôme Lejeune Fondation. Duration: 2020-2023. 86.694,20 €.
- Carmona Iragui, Maria. Multimodal assessment of brain inflammatory biomarkers in DS-associated AD. AARG-22-973966. Alzheimer's Association. Duration: 2023-2025. 141.246,28 €.
- Dols Icardo, Oriol. Estudio longitudinal del papel de las celulas inmunitarias periféricas en la volución de la ELA. FUND.HNA. Fundación HNA. Duration: 2021-2023. 100.000,00 €.
- Dols Icardo, Oriol. Estudio transcriptómico de la demencia frontotemporal para la comprensión de sus bases moleculares e identificación de biomarcadores que reflejen su sustrato neuropatológico in vivo. PI18/00326. Instituto de Salud Carlos III (ISCIII). Duration: 2019-2023. 135.520,00 €.
- Dols Icardo, Oriol. Caracterización transcriptómica y neuropatológica del tejido postmortem de pacientes con esclerosis lateral amiotrófica portadores de la expansión en el gen C9orf72. PI21/01395. Instituto de Salud Carlos III (ISCIII). Duration: 2022-2024. 87.120,00 €.
- Dols Icardo, Oriol. Assessing peripheral inflammation in DS at different stages of AD. AARF-22-924456. Alzheimer's Association. Duration: 2022-2025. 147.402,61 €.
- Fortea Ormaechea, Juan. INMUNGEN-CoV2: Estudio genético de la severidad de COVID-19. F. TATIANA PREDOC 2020. Fundación Tatiana Pérez de Guzmán El Bueno. Duration: 2021-2024. 39.160,00 €.
- Fortea Ormaechea, Juan. Contractes per a la intensificació de l'activitat investigadora al SNS 2021. INT21/00073. Instituto de Salud Carlos III (ISCIII). Duration: 2022-2023. 60.000,00 €.
- Fortea Ormaechea, Juan. Caracterización de la inflamación relacionada con amiloide: nuevos marcadores inflamatorios y su impacto en la macroestructural y microestructura cortical en la enfermedad de Alzheimer preclínica y prodrómica. PI20/01473. Instituto de Salud Carlos III (ISCIII). Duration: 2021-2023. 214.775,00 €.
- Fortea Ormaechea, Juan. Mes-CoBraD: Multidisciplinary Expert System for the Assessment & Management of Complex Brain Disorders. MES-CoBraD 965422. Unión Europea. Duration: 2021-2024. 482.771,25 €.
- Fortea Ormaechea, Juan. The Role of Inflammation and NGF Dysfunction in the Evolution of Alzheimer Disease Pathology in Down syndrome. NIH THE REGENTS 1R01AG056850-01A1. The Regents of the University of California. Duration: 2018-2023. 1.872.312,87 €.
- Fortea Ormaechea, Juan. Clinical trials to prevent Alzheimer's Disease in Down Syndrome. NIH SOUTHERN R33AG066543. University of Southern California. Duration: 2019-2024. 340.242,00 €.
- Fortea Ormaechea, Juan. Exosomal Tau Pathology in Down Syndrome. R01AG061566. National Institute of Aging (NIH-NIA). Duration: 2018-2023. $ 10.000,00 €.
- Gimenez Badia, Sandra. Síndrome de apnea-hipopnea del sueño y síndrome de Down: cognición, biomarcadores de Enfermedad de Alzheimer en plasma, líquido cefalorraquídeo y resonancia magnética. PI20/00836. Instituto de Salud Carlos III (ISCIII). Duration: 2021-2023. 77.440,00 €.
- Gimenez Badia, Sandra. The impact of Alzheimer's disease on sleep in adults with Down Syndrome. JLF #1801 -S GIMENEZ. Jérôme Lejeune Fondation. Duration: 2020-2024. 86.699,13 €.
- Gimenez Badia, Sandra. Evaluation of the circadian rest-activity rhythm in adults with DS. GBHI ALZ UK-23-971107. Alzheimer's Association. Duration: 2023-2026. 24.987,00 €.
- Illan Gala, Ignacio. Contractes Juan Rodés 2020. JR20/00018. Instituto de Salud Carlos III (ISCIII). Duration: 2021-2024. 180.000,00 €.
- Illan Gala, Ignacio. Avanzando la clasificación de la demencia frontotemporal y la esclerosis lateral amiotrófica mediante neuroimagen microestructural y funcional, y biomarcadores sanguíneos de neurodegeneración y neuroinflamación.

PI21/00791. Instituto de Salud Carlos III (ISCIII). Duration: 2022-2024. 129.470,00 €.

- Illan Gala, Ignacio. Unveiling the impact of biological sex along sporadic and genetic FTLD. AACSF-21-850193. Alzheimer's Association. Duration: 2021-2024. 147.286,04 €.
- Lleo Bisa, Alberto. Acúmulo de Proteína Precursora de Amiloide-C99 (APP-C99) como mecanismo de enfermedad en la enfermedad de Alzheimer: implicaciones terapéuticas. PI20/01330. Instituto de Salud Carlos III (ISCIII). Duration: 2021-2023. 183.920,00 €.
- Lleo Bisa, Alberto. NEUROBIOLOGIA DE LES DEMENCIES. 2022 INV-1 00048. Agència de Gestió d'Ajuts Universitaris i de Recerca (AGAUR). Duration: 2022-2024. 66.217,84 €.
- Lleo Bisa, Alberto. Estudio de la patología sináptica de Tau mediante Array Tomography y microscopia de superresolución. FUND. TATIANA 2022. Fundación Tatiana Pérez de Guzmán El Bueno. Duration: 2023-2025. 33.000,00 €.
- Lleo Bisa, Alberto. iLEADS AlzAss. SG-23-1014431 iLEADS. Alzheimer's Association. Duration: 2022-2023. 59.831,52 €.
- Padilla Franco, Concepción. Contractes Sara Borrell 2020. CD20/00133. Instituto de Salud Carlos III (ISCIII). Duration: 2011-2022. 80.598,00 €.
- Rozalem Aranha, Mateus. Evaluation of cortical microinfarcts in individuals with Down syndrome. AARFD-21-852492. Alzheimer's Association. Duration: 2022-2025. 147.627,00 €.
- Rodríguez Baz, Iñigo. Contratos Rio Hortega 2022. CM22/00052. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2024. 65.000,00 €.
- Sala Matavera, Isabel. Estudio sobre las características del proceso de cese de la conducción en personas mayores con y sin deterioro cognitivo. INN00003. IIBSP-CON-2022-11. Fundacion MAPFRE. Duration: 2022-2023. 19.123,70 €.
- Sánchez Aced, Erika. Contratos i-PFIS 2022. IFI22/00015. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2026. 89.900,00 €.
- Santos Santos, Miguel Angel. Contratos Juan Rodés 2018. JR18/00018. Instituto de Salud Carlos III (ISCIII). Duration: 2019-2023. 180.000,00 €.
- Santos Santos, Miguel Angel. Afasia primaria progresiva: Caracterización multimodal de los síntomas, fisiopatología y progresión. PI19/00882. Instituto de Salud Carlos III (ISCIII). Duration: 2020-2024. 111.320,00 €.
- Santos Santos, Miguel Angel. Rehabilitating Communication in bilingual Speakers with Language-Prominent Dementia. UT AUSTIN GRANT. Texas Global. Duration: 2021-2023. 18.811,00 €.
- Santos Santos, Miguel Angel. Molecular bases of bilingualism's protective effect vs cognitive decline. AACSF-22-972945. Alzheimer's Association. Duration: 2023-2025. 164.789,51 €.
- Santos Santos, Miguel Angel. Bilingual Factors Associated with Cognitive Reserve and Linguistic Resilience in Hispanics with Primary Progressive Aphasia. NIH - UTexas 1R01AG080470-01 . National Institute on Aging (NIA) at the National Institute of Health (NIH). Duration: 2023-2027. 1.063.462,00 €.
- Sirisi Dolcet, Sónia. Ayudas para contratos Juan de la Cierva - Incorporación 2019. IJC2019-038962-I. Ministerio de Ciencia e Innovación (MICINN). Duration: 2021-2024. 93.000,00 €
- Zhu, Nuole. Contractes Rio Hortega 2021. CM21/00113. Instituto de Salud Carlos III (ISCIII). Duration: 2022-2023. 65.000,00 €.
- Valle Tamayo, Natalia. Contratos PFIS 2022. FI22/00077. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2026. 119.567,00 €.

GRANTS AWARDED

- Dols Icardo, Oriol Dols Icardo, Oriol. Identificación de ARN pequeños en suero como biomarcadores subrogados de los niveles de pTDP43 en el sistema nervioso central. FUNDELA 2023. Fundela Fundación Española Investigación Esclerosis Lateral (FUNDELA). Duration: 2023-2025. 50.000,00 €.
- Dols Icardo, Oriol. PMP-DEGESCO: Validation of a precision medicine tool based on online cognitive evaluation, genetic risk stratification and bloodbased biomarkers for the identification of preclinical Alzheimer's Disease. PMP22/00022. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2025. 290.400,00 €.

- Fortea Ormaechea, Juan. Sleep and Temperature Disturbance as risk factors for Alzheimer's Disease in Down Syndrome: a Longitudinal Study. NIH NY Fortea 1RF1AG080769-01. National Institute on Aging (NIA) at the National Institute of Health (NIH). Duration: 2023-2028. 1.829.573,72 €.
- Fortea Ormaechea, Juan. DS-ARC: A Remote Digital Cognitive Assessment for Down Syndrome-Associated Alzheimer's Disease. NIH FORTEA Washington 1R01AG081394-01. National Institute On Aging/NIH/DHHS. Duration: 2023-2028. 751.864,51 €.

DOCTORAL THESES DEFENDED

- Rozalem Aranha, Mateus. Cortical Microinfarcts evaluation in patients with Down syndrome. Universitat Autònoma de Barcelona; Universidade de Sao Paulo. 7/11/2023. Supervisors: Fortea Ormaechea, Juan; da Costa Leite, Cláudia; Martins Coutinho, Artur; Lleó Bisa, Alberto.
- Videla Toro, Laura. Neuropsychological and fluid biomarker changes in the Alzheimer's disease continuum in adults with Down syndrome. Universitat Autònoma de Barcelona. 25/01/2023. Supervisors: Fortea Ormaechea, Juan; Lleó Bisa, Alberto. http://hdl.handle.net/10803/688774.

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- Fortea J, García E, García G, Canal N, Maurino J. Burnout among neurologists caring for patients with cognitive disorders in Spain. PLoS One. 2023; 18(5):e0286129. DOI:10.1371/journal.pone.0286129. PMID:37228146. IF:3,700 (Q2/4D). Document type: Article.
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