

Neurobiology of Dementias

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DESCRIPTION

This multidisciplinary team comprises 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, as well as Master's students and pre- and postdoctoral researchers. The group provides an excellent setting for training young researchers in a unique translational environment.

MAIN LINES OF RESEARCH

- Natural History, Diagnosis and Treatment of Frontotemporal Lobular Degeneration. (Illán Gala, Ignacio).
- Characterisation of epilepsy in Alzheimer's disease and Down syndrome. (Carmona Iragui, María).
- Sleep and neurodegeneration. (Giménez Badia, Sandra).
- Integrative Genomic and Transcriptomic Approaches to Neurodegenerative Diseases with a Focus on Neuroinflammation. (Dols Icardo, Oriol).
- Clinical application of biochemical markers in degenerative dementias. (Alcolea Rodríguez, Daniel Andrés).
- New tools for neuropsychological assessment in people with Down syndrome. (Del Hoyo Soriano, Laura).

- New neuropsychological assessment tools in neurodegenerative dementias, sporadic. (Sala Matavera, Isabel).
- Multimodal neuroimaging in neurodegenerative diseases. (Bejanin, Alexandre Pierre Armand).
- Cellular and neuropathological basis of neurodegenerative diseases. (Lleó Bisa, Alberto).
- Neurobiology of Language and Cognition in Degenerative Disease: From Mechanisms to Clinical Application. (Santos Santos, Miguel Ángel).
- Sporadic and Genetically Determined Alzheimer's Disease: From Natural History to Biological Diagnosis and Treatment. (Forte Ormaechea, Juan).

SCIENTIFIC CHALLENGES

Since its founding over 15 years ago, our group has experienced a continual and exponential growth, firmly consolidating itself 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 organisational 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 it achieves. Moving forward, our objective is to maintain sustainable growth without compromising 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 activities. For example, digital tools and plasma biomarkers are already here, and pharmacological treatments that alter 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, prioritising 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 & AWARDED GRANTS

- 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. Contratos para la intensificación de la actividad investigadora en el Sistema Nacional de Salud 2023. INT23/00048. Instituto de Salud Carlos III (ISCIII). Duration: 2024-2026. 60.000,00 €
- Aumatell Escabias, Joaquim. Contratos PFIS 2024. FI24/00215. Instituto de Salud Carlos III (ISCIII). Duration: 2025-2028. 119.567,00 €
- Arriola Infante, José Enrique. Contratos Río 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 €
 - Bejanin, Alexandre Pierre Armand. Urban design for brain and cognitive health: exploring its impact on aging and dementia. 23S06157-001. Ajuntament de Barcelona. Duration: 2023-2025. 35.401,10 €
 - Benítez Amaro, Aleyda. Contratos Sara Borrell 2024. CD24/00083. Instituto de Salud Carlos III (ISCIII). Duration: 2025-2028. 95.000,00 €
 - 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. Ensayo en fase III para evaluar la seguridad y eficacia de LEvetiracetam para prevenir las crisis epilépticas en adultos con síndrome de Down y enfermedad de Alzheimer. ICI23/00032. Instituto de Salud Carlos III (ISCIII). Duration: 2024-2027. 905.677,30 €
 - 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 €
 - Carmona Iragui, Maria. 2nd Conference on Genetically determined Alzheimer's Disease: Research Advances in Down Syndrome & Autosomal Dominant Alzheimer's Disease. #2425_GRT-2024B. Jérôme Lejeune Fondation. Duration: 2024-2025. 10.000,00 €
 - Del Hoyo Soriano, Laura. Contratos Miguel Servet 2024. CP24/00112. Instituto de Salud Carlos III (ISCIII). Duration: 2025-2029. 268.600,00 €
 - Del Hoyo Soriano, Laura. A Novel Digitalized Measure for Preventive Clinical Trials in Down syndrome. No.2326 2024a. Jérôme Lejeune Fondation. Duration:2024-2027. 49.985,00 €
 - Dols Icardo, Oriol. Estudio longitudinal del papel de las células inmunitarias periféricas en la evolución de la ELA. FUND.HNA. Fundación HNA. Duration: 2021-2024. 100.000,00 €
 - 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 €
 - 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 €
 - Dols Icardo, Oriol. Assessing the role of CSF immune cells in ALS. FUND. LUZON 2024. Fundación Luzon. Duration: 2024-2027. 158.960,00 €
 - Dols Icardo, Oriol. Caracterización del papel de las células Natural Killer y sus exosomas en la ELA. FUNDELA 2024. Fundela Fundación Española Investigación Esclerosis Lateral. Duration: 2024-2025. 69.850,00 €
 - Dols Icardo, Oriol. Estudio del papel de la inflamación periférica en el continuo esclerosis lateral amiotrófica/demencia frontotemporal a resolución celular. PI24/01087. Instituto de Salud Carlos III (ISCIII). Duration: 2025-2027. 121.250,00 €

- Dols Icardo, Oriol. Assessing the role of the peripheral immune system in the Down Syndrome population at different stages of Alzheimer's Disease using single-cell RNA sequencing. PDC-2023-51. Jerome Lejeune Foundation. Duration: 2024-2025. 130.000,00 €
- Fortea Ormaechea, Juan. Interacción de la inflamación del sistema nervioso periférico y central en la enfermedad de Alzheimer y el síndrome de Down. PI23/01786. Instituto de Salud Carlos III (ISCIII). Duration: 2024-2026. 252.500,00 €
- 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. 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. 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. 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 €
- Fortea Ormaechea, Juan. Longitudinal multicenter headtohead harmonization of tau PET. 5R01AG073267-04. National Institute of Health (NIH). Duration: 2024-2025. 502.069,00 €
- Fortea Ormaechea, Juan. The role of immune deregulation and NGF dysmetabolism in the development of Alzheimer disease in individuals with Down syndrome. AG087280. National Institute of Health (NIH). Duration: 2024-2025. 247.100,00 €
- García Castro, Jesús. Contratos Río Hortega 2023. CM23/00176. Instituto de Salud Carlos III (ISCIII). Duration: 2024-2026. 65.000,00 €
- Giménez 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: 2021-2024. 77.440,00 €
- Giménez Badia, Sandra. The impact of Alzheimer's disease on sleep in adults with Down Syndrome. JLF #1801 -S Giménez. Jérôme Lejeune Fondation. Duration: 2020-2024. 86.699,13 €
- Giménez 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 FTLT. AACSF-21-850193. Alzheimer's Association. Duration: 2021-2024. 147.286,04 €
- Illan Gala, Ignacio. Cambios Microestructurales en la Degeneración Lobular Frontotemporal: Implicaciones diagnósticas, Pronósticas y Etiológicas. PI24/00598. Instituto de Salud Carlos III (ISCIII). Duration: 2025-2027. 215.000,00 €

- Lleó 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 €
- Lleó 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 €
- Lleó Bisa, Alberto & Sirisi Dolcet, Sonia. APP-C99 como componente patogénico clave y una diana terapéutica en la enfermedad de Alzheimer. PI23/01767. Instituto de Salud Carlos III (ISCIII). Duration: 2024-2026. 215.000,00 €
- Lleó Bisa, Alberto. Mecanismos de vulnerabilidad de interneuronas parvalbumina dependientes de sexo en la enfermedad de Alzheimer. AC24/00133. Instituto de Salud Carlos III (ISCIII). Duration: 2025-2027. 155.000,00 €
- Lleó Bisa, Alberto. Are epigenomic changes in the Alzheimer's Disease continuum modifiable? A discovery, validation and interventional study. FPM 2022-1227. Fundació Pasqual Maragall. Duration: 2024-2029. 147.372,47 €
- Lleó Bisa, Alberto. A novel therapeutic target for Alzheimer's disease beyond A β . GINJOL 2024-13-002. Fundació Institució dels Centres de Recerca de Catalunya (iCERCA). Duration: 2025-2025. 10.000,00 €
- Maure Blesa, Lucía. Contratos Río Hortega 2023. CM23/00291. Instituto de Salud Carlos III (ISCIII). Duration: 2024-2026. 65.000,00 €
- 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 Río Hortega 2022. CM22/00052. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2024. 65.000,00 €
- Sánchez Aced, Erika. Contratos i-PFIS 2022. IFI22/00015. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2026. 89.900,00 €
- Sánchez Aced, Erika. Caracterización de nuevos anticuerpos monoclonales contra la proteína precursora de amiloide en tejido cerebral humano usando Array Tomography Microscopy. MV24/00031. Instituto de Salud Carlos III (ISCIII). Duration: 2025-2025. 9.660,00 €
- Santos Santos, Miguel Ángel. 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 Ángel. 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 Ángel. 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, Sonia. Ayudas para contratos Juan de la Cierva - Incorporación 2019. IJC2019-038962-I. Ministerio de Ciencia e Innovación (MICINN). Duration: 2021-2024. 93.000,00 €
- Valle Tamayo, Natalia. Contratos PFIS 2022. FI22/00077. Instituto de Salud Carlos III (ISCIII). Duration: 2023-2026. 119.567,00 €
- Valle Tamayo, Natalia. The role of Neuropentraxin 2 pathology in ALS and other neurodegenerative diseases. MV24/00056. Instituto de Salud Carlos III (ISCIII). Duration: 2025-2025. 10.580,00 €

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- subcallosal cingulate and nucleus accumbens in severe anorexia nervosa. 2024; 166(1):364. DOI:10.1007/s00701-024-06258-w. PMID:39261306. IF:1,900 (Q2/5D). Document type: Article.
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