

## **Impacto de la señalización astrocitaria en la conducta social (Social\_Stars)**

Proyecto PID2022-142617NB-I00. IP: Gertrudis Perea

El candidato/a se incorporará al grupo de investigación de Redes NeuroGliales del Instituto Cajal. Su actividad se centrará en estudiar la señalización entre astrocitos y neuronas y el impacto de ésta en comportamiento social, tomando el ratón como modelo experimental (Proyecto PID2022-142617NB-I00. IP: Gertrudis Perea).

Capacidades y competencias: La concesión de esta ayuda permitirá al candidato/a además de incrementar y mejorar su formación teórica en Neurociencia, adquirir habilidades experimentales altamente complejas que incluyen la manipulación de animales de laboratorio y realización de tests comportamentales combinados con registros de calcio intracelular y electrofisiología, tanto in-vivo como ex-vivo. Todo ello permitirá adquirir un mayor grado de madurez e independencia a nivel teórico y experimental necesarios para el futuro desarrollo de una exitosa carrera científica.

Plan de formación: Este contrato predoctoral favorece la obtención del grado de doctor. El candidato/a tendrá que incorporarse a un Programa de Doctorado relacionado con la temática de estudio. El candidato/a se involucrará en la dinámica del laboratorio, que incluye además del trabajo experimental, la presentación y discusión semanal de resultados científicos con el grupo de trabajo, así como la discusión de artículos científicos de relevancia en el campo. Reuniones mensuales con el tutor para evaluar la progresión de los objetivos establecidos, y discutir posibles incidencias surgidas durante su ejecución. Asistencia a los seminarios de los 3 departamentos del I. Cajal, y asistencia a los seminarios de Instituto, de carácter semanal, con ponentes de relevancia internacional. Derivado de sus resultados experimentales, el candidato/a participará en congresos y/o reuniones científicas nacionales e internacionales relevantes para su formación.

Este contrato predoctoral favorece la obtención del grado de doctor. El candidato/a tendrá que incorporarse a un Programa de Doctorado relacionado con la temática de estudio.

**CURRICULUM VITAE ABREVIADO (CVA)**

**Part A. PERSONAL INFORMATION**

First name	GERTRUDIS		
Family name	PEREA PARRILLA		
Gender (*)	Female		
Social Security, Passport, ID number	26229428K		
e-mail	gperea@cajal.csic.es	<a href="http://www.cajal.csic.es/departamentos/gertrudis-perea/gertrudis-perea.html">http://www.cajal.csic.es/departamentos/gertrudis-perea/gertrudis-perea.html</a>	
Open Researcher and Contributor ID (ORCID) (*)	<b>0000-0001-5924-9175</b>		

(\*) *Mandatory*

**A.1. Current position**

Position	Científico Titular CSIC		
Initial date	02-2016		
Institution	Spanish National Research Council, CSIC		
Department/Center	Functional and System Neurobiology	Instituto Cajal	
Country	Spain	Teleph. number	915854710
Key words	Neuron-glia interactions, astrocytes, synaptic physiology		

**A.2. Previous positions (research activity interruptions, indicate total months)**

Period	Position/Institution/Country/Interruption cause
01/09/2001- 22/09/2006	PhD student / Cajal Institute / Spain
23/09/2006 - 31/01/2010	Postdoctoral position / Cajal Institute / Spain
01/02/2010- 31/08/2010	Postdoctoral position. Picower Institute for Learning and Memory. Massachusetts Institute of Technology. Cambridge (MA), USA
1/09/2010 - 31/01/2014	Marie Curie Postdoctoral fellow. Picower Institute for Learning and Memory. Massachusetts Institute of Technology. Cambridge (MA), USA
01/02/2014 - 24/02/2016	Ramón y Cajal, Tenure track position. Cajal Institute / Spain
25/02/2016 -	Científico Titular (CSIC). Permanent position. Cajal Institute / Spain
09/2020 - 03/2021	Maternity leave

**A.3. Education**

PhD, Licensed, Graduate	University/Country	Year
PhD Neuroscience	Universidad Autónoma de Madrid (UAM)	2006
Licensed in Biological Sciences	Universidad Complutense Madrid (UCM)	2001

**Part B. CV SUMMARY**

I am a CSIC Researcher (Científico Titular) and Head of the “Neuron-Glia Networks Lab” at the Cajal Institute (Madrid, Spain) since 2016. Our interest is focused on understanding the role of astrocytes, a glial cell type, in the neural coding underlying brain activity and complex animal behaviors. Neuron-astrocyte signaling encompasses a broad spectrum of functions, from the ion homeostasis to metabolic fuel for neuronal activity, with relevant physiological consequences for the nervous system. The location of astrocyte processes facing synapses places them in a strategic position to regulate synaptic transmission, which is known as tripartite synapses. Our results have contributed to consolidate the concept of Tripartite Synapse in Neuroscience, showing that astrocytes can modulate neuronal activity targeting presynaptic and postsynaptic receptors, being involved in synaptic plasticity processes. Then,



from the point of view of information coding, neuron-astrocyte signaling can provide to neural circuits an additional layer of computation, extending the capabilities of single neurons to transmit information. Combining molecular approaches, electrophysiology, imaging techniques and behavioral testing, we investigate the role of astrocytes in the synaptic and network function and how its dysfunction might underlie neurological diseases.

Our findings have been recognized by scientific community with notable impact (5556 citations, H index: 31; Scopus).

I have published 42 scientific works (38 peer-review articles, 4 book chapters):

Publications in the first decile (D1): 20/38; Publications in the first quartile (Q1): 32/38

Thesis supervised: 4

Sara Mederos, November 2019. Cum Laude.

Candela González Arias, estimated defense in 2023.

Andrea Sánchez Ruiz, estimated defense in 2025.

Faezeh Ashouri, estimated defense in 2025

Master Thesis supervised: 7

#### Scientific Management Activities:

- Referee ad hoc for Scientific Journals (selected): Science, Nature Neuroscience, Nature Communications, Cerebral Cortex; Molecular Psychiatry; Glia; Current Opinion in Neurobiology; Frontiers in Neuroscience; PLoS Computational Biology; Epilepsy; Neuroscience; NeuroPharmacology; PLoS ONE; Journal of Neurochemistry; Brain Research Reviews; Frontiers in Neural Circuits; FEBS Letters; American Journal Physiol-Cell Physiology; Experimental Cell Research.
- Referee ad hoc in Research Grants: H2020, European Union. AEI (ANEP), Spain. The Wellcome Trust, UK. Independent Research Fund Denmark | Medical Sciences. Biotechnology and Biological Sciences Research Council (BBSRC), UK. NEURON ERANET:NEURON, European Union. Israel Science Foundation, Israel. French National Research Agency (ANR). Comisión Sectorial de Investigación Científica (CSIC), Uruguay. Comisión Nacional de Investigación Científica y Tecnológica (CONICYT), Chile. Agencia Andaluza del Conocimiento (AAC), Junta de Andalucía, Spain.
- Associate Editor for: Glia (since September 2019); Frontiers in Cellular Neuroscience - Non-Neuronal Cells (since April 2019); Brain Sciences, NeuroGlia section (since March 2019).

#### Institutional and teaching activities:

- Secretary of the Spanish Society of Neuroscience (SENEC). 2017-2019.
- Vicepresident of the Spanish Society of Neuroscience (SENEC). 2019- 2021.
- Head of the Functional and Systems Neurobiology Department, Instituto Cajal (September 2019-June 2021).
- Director of the Master course: “Neurobiología Celular. Fisiología de las Membranas Excitables”. Master in Neuroscience. Dept. Anatomy, Histology and Neuroscience, Faculty of Medicine, Universidad Autónoma de Madrid and Instituto Cajal (CSIC), since 2014.

#### Mentoring:

- Sara Mederos. Master student. Universidad Autónoma de Madrid, UAM (2014-2015). *PhD student* 2015-2019. PhD Cum Laude. **Best Thesis Award 2019 by Universidad Complutense de Madrid (UCM). Alberto Rábano Award to the Best Thesis in Neuroscience 2019 by Fundación Romanillos. FENS EJM Young Investigator Prize 2022 winner.**
- Candela González Arias. Master student. UAM (2016-2017). *PhD student* 2017-. Estimated defense in 2023.
- Andrea Sánchez Ruiz. Master student. UAM (2020-2021). *PhD student* 2021-. Estimated defense in 2025.
- Faezeh Ashouri. *PhD student* 2021. H2020-MSCA-ITN-2020. Estimated defense in 2025.
- Lucía de Arancibia Casillas. Research assistant 2021-2023 (#PEJ-2020-AI/BMD-18675)
- Cristina Sánchez Puelles. Postdoc (2018).
- José Jorge Ramírez Franco. Postdoc (2017).
- Alicia Hernández Vivanco. Postdoc (2014-2016).

#### Fellowships and Awards:



- Talento Andaluz, 2023. Granted by Junta de Andalucía.
- Tenure-Track position “Ramón y Cajal Program”. RYC-2012-12014.
- Marie Curie Postdoctoral Fellowship. 2010. (PIOF-GA-2009-253635).
- Human Frontiers Science Program. Postdoctoral Fellowship. 2010. DECLINED
- Best PhD Thesis Award in 2006 of Faculty of Medicine, Universidad Autónoma de Madrid.
- “Scientific Highlight of the Year 2007 (FENS)”. Perea, G and Araque, A (Science, 2007).
- Pfizer Foundation Award Basic Research 2008.

**Outreach activities:** Seminario “1ª Jornadas Dones in Neurociencia”, Universidad de Valencia (2018). “Jornadas de puertas abiertas, Centenario del Instituto Cajal” (2020). Several radio and newspaper interviews and social media to bring our research to the general public (El Mundo, Ideal Periódico, SEBBM Divulgación, Ateneo Ilugo) .

## Part C. RELEVANT MERITS (sorted by typology)

### C.1. PUBLICATIONS

Selected 10 publications (CA: corresponding author):

1. González-Arias, C. et al. **2023**. Dysfunctional serotonergic neuron-astrocyte signaling in depressive-like states. *Mol Psychiatry*. 2023 Sep 29. doi: 10.1038/s41380-023-02269-8. **CA**
2. Mederos S, Sánchez-Ruiz A, Perea G. **2022**. Protocol to downregulate GABAergic-astrocyte signaling via astrocyte-selective ablation of GABAB receptor in adult mice. *STAR Protoc*.3(4):101667. doi: 10.1016/j.xpro.2022.101667. **CA**.
3. Mederos S; et al. (6/6) **2021**. GABAergic signaling to astrocytes in the prefrontal cortex sustains goal-directed behaviors. *Nat Neurosci*. 24(1):82-92. doi: 10.1038/s41593-020-00752-x. **CA**.
4. Escartin C; et al (consortium) **2021**. Reactive astrocyte nomenclature, definitions, and future directions. *Nat Neurosci*. 24(3):312-325. doi: 10.1038/s41593-020-00783-4.
5. Mederos S; et al. (8/8). **2019**. Melanopsin for precise optogenetic activation of astrocyte-neuron networks. *Glia*. 67(5):915-934. doi: 10.1002/glia.23580. **CA**.
6. Mederos S; et al. (3/3). **2018**. Astrocyte–Neuron Networks: A Multilane Highway of Signaling for Homeostatic Brain Function. *Front Synaptic Neurosci*. 10: 45. doi: 10.3389/fnsyn.2018.00045. **CA**.
7. Gomez-Gonzalo M; et al. (14/13). **2017**. Neuron-astrocyte signaling is preserved in the ageing brain. *Glia*. ISSN: 1098-1136. doi: 10.1002/glia.23112. **CA**.
8. Perea G; et al. (19/1). **2016**. Activity-dependent switch of GABAergic inhibition into glutamatergic excitation in astrocyte-neuron networks. *eLife*. ISSN: 2050-084X. doi: 10.7554/eLife.20362. **CA**.
9. Martin R; et al. (5/4). **2015**. Circuit-specific signaling in astrocyte-neuron networks in basal ganglia pathways. *Science*. ISSN: 1095-9203. 349-6249. doi: 10.1126/science.aaa7945.
10. Perea G; et al. (4/1). **2014**. Optogenetic astrocyte activation modulates response selectivity of visual cortex neurons in vivo. *Nature Commun*. ISSN: 2041-1723. 5:3262: 10.1038/ncom. **CA**.

### C.2. CONGRESS

The lab attends regularly with posters to national and international meetings of the field: Spanish Neuroscience Society meeting (SENC), European Federations of Neurosciences (FENS), EuroGlia, Society for Neurosciences (SfN).

Invited speaker (selected):

- Gordon Research Conferences. Glial Biology: Functional interactions among glia & neurons. 2007. March 11-16; 2019 March 3-8, Ventura, CA. U.S.A.
- International Astrocyte School (IAS). 2015, 2022, 2023. Bertinoro, Italy.
- Invited Foreign Expert to annual meeting of the Priority Program of the DFG. 2008. Germany.
- European Meeting on Glial Cells in Health and Disease (EuroGLIA): 9<sup>th</sup> EuroGLIA meeting 2009, Paris, France. XIV EuroGLIA meeting 2019 Porto, Portugal; XVI EuroGLIA meeting 2023, Berlin, Germany.
- IBRO's 2011 World Congress of Neuroscience. 2011. July 14-17. Florence, Italy.
- ISN Advance School. 2012. July 11-13. Barcelona, Spain.
- Invited Speaker to the German Neuroscience Society. 2013. March 13-16. Goettingen, Germany.
- Achucarro Basque Center for Neuroscience. 2013. May 31. Bilbao. Spain.
- PhD Course on Neuron Glia Interactions. University of Copenhagen. 2013, 2021 (Co-organizer). Copenhagen, Denmark.

- European Federations of Neurosciences (FENS). 2014. July 5-9. Milan, Italy.
- 23rd Annual Symposium of the French Club of Glial Cells. 2016. June 1-3. Carry-Le-Rouet, France.
- New opportunities for NIH-CSIC collaboration. May 24th, 2017. Madrid. Spain.
- International Symposium on Metabolic and Redox Interactions between Neurons and Astrocytes in Health and Disease. 2017. June 26-28. Salamanca, Spain.
- Bonn Lecture Series in Neuroscience. University of Bonn. 2018. April 6th. Bonn, Germany.
- 16th Annual Conference of the Hungarian Neuroscience Society. 2019. January 17-18. Debrecen, Hungary.
- European Federations of Neurosciences (FENS). 2020. July 11-15. Glasgow, UK (virtual forum).
- Glial cells-neuron crosstalk in CNS health and disease. International workshop. October 2020. Turin, Italy.
- 8th Mediterranean Neuroscience Society Conference. 2022. Dubrovnik, Croatia.
- Minisymposium “Optogenetic manipulation of astrocytes to control behavior”, Society for Neuroscience (SfN) 2022. San Diego, CA. USA
- 1st Severo Ochoa Conference: «Astrocyte-neuron metabolic coupling in organismal (patho) physiology». 2023. Salamanca, Spain.

### C.3. RESEARCH PROJECTS

Grants funded as PI or partner.

1. Deciphering the role of astrocytic signaling in social behavior (Social\_Stars) (PID2022-142617NB-I00). AEI/MICINN (Spain). PI. Gertrudis Perea.
2. E2F4DN como agente geroterapéutico para el envejecimiento cerebral (GeroE2F4DN). (#PLEC2022-009385). Co-PI. Coordinator: José Maria Frade (I. Cajal). 1/09/2022 – 31/08/2023.
3. Fundación La Marató TV3 Project: “Gliotransmisors i receptors de cannabinoides en l'origen dels déficits cognitius i de plasticitat sinàptica en la malaltia de Huntington" (# 225619). Private funding. Coordinator: Silvia Ginés (UAB). Co-PI. 11/05/2021 – 10/05-2025.
4. Program for research assistant contracts of the Community of Madrid 2020 (#PEJ-2020-AI/BMD-18675). 01/01/2021 – 31/12/2022. Plan Regional de Investigación Científica e Innovación Tecnológica de Madrid (2016-2020).
5. Disruptive materials, technologies & approaches to unravel the role of Astrocytes in brain function and dysfunction: towards to Glial interfaces (#956325; H2020-MSCA-ITN-2020). Marie Skłodowska-Curie Actions. 01/11/2020 – 31/10-2024.
6. Role of serotonergic-driven astrocyte signaling in cognitive functions (SER\_Astrocyte) (#PID2019-106579RB-I00). MICINN (Spain). PI: Gertrudis Perea. 01/06/2020- 31/05/2023.
7. PV+ interneuron and Astrocyte signaling: impact on the inhibitory synaptic transmission of cortical circuits (#BFU2016-75107-P). MINECO (Spain). PI: Gertrudis Perea. 30/12/2016-31/12/2020.
8. Astrocyte-Interneuron signaling and the information processing by neural networks (#BFU2013-47265-R). MINECO (Spain). PI: Gertrudis Perea. 01/01 / 2014-31 / 12/2016.
9. Brain dysfunction during aging: relevance for Alzheimer's disease. MINECO (Spain). (#CONSOLIDER-Ingenio Program 2010). WP leader: Gertrudis Perea. 30/12/2010-30/6/2016.
10. Role of astrocytes in neuronal network function in visual cortex. (FP7 PEOPLE. NEUGLIANET #253635). Marie Skłodowska-Curie Actions. European Commission. (Picower Institute for Learning and Memory, MIT and Cajal Institute, CSIC). PI: Gertrudis Perea. 01/08/2010-31/01/2014.