
BIOGRAPHICAL SKETCH

NAME: Montani, Caterina

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POSITION TITLE: Researcher

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE	Completion Date MM/YYYY	FIELD OF STUDY
University of Alcalá de Henares, Madrid, Spain	B.S (Erasmus project)	02/2006	Biotechnology
University of Florence, Italy	B.S	07/2007	Biotechnology
University of Milan, Italy	MSc (Thesis internship)	03/2010	Pharmaceutical biotechnology
University of Florence, Italy	MSc	04/2010	Pharmaceutical biotechnology
CNR, Institute of Neuroscience, Milan, Italy	Graduated student fellow	09/2011	Neuroscience
University of Milan and CNR, Institute of Neuroscience, Italy	PHD	12/2014	Neuroscience
CNR, Institute of Neuroscience, Milan	Postdoctoral fellow	09/2015	Neuroscience
San Raffaele University, Milan, Italy	Postdoctoral fellow	04/2016	Electrophysiology
CIBIO, University of Trento, Italy	Postdoctoral fellow	02/2019	Neuroscience
Italian Institute of Technology (IIT), Rovereto, Italy	Postdoctoral fellow	01/2023	Neuroscience

A. Personal Statement

Since April 2023, I have been working as a researcher at San Martino Hospital (IRCCS Ospedale Policlinico San Martino, Genova, Italy). I have a well-established expertise in resting-state fMRI, synaptic dysfunctions and preclinical models of neurodevelopmental and neurodegenerative diseases. I was recently awarded with a grant from the Italian ministry of health, to study sex-specific brain networks alterations in multiple sclerosis, through the application of fMRI techniques. My doctoral and early postdoctoral research focused on how genetic mutations linked to neurodevelopmental and neurodegenerative disorders impact neuronal maturation, synaptic protein expression, neurotransmitter release, and brain physiology. I employed various biochemical and genetic techniques on rodent neuronal primary cultures and human iPS cells, including CRISPR-Cas9 and fluorescent functional imaging, to dissect the molecular mechanisms underlying atypical or pathological phenotypes. As a postdoctoral fellow at the Italian Institute of Technology (Rovereto, Italy), I integrated *in vivo* MRI, behavioral testing, and immunohistochemical analyses in mouse models to investigate the role of target genes in neural circuitry and brain-wide functional networks. With the progression of my career, I have developed the ability to design experiments in a way that ensured reproducibility and I learned how to critically decipher experimental data and results. Through each project, I have acquired in-depth experience with necessary techniques, building a strong multidisciplinary background. By combining my expertise with the complementary skills of my collaborators, we have built strong teams to successfully conduct experimental studies, write papers and grant applications, and I had the chance to publish our results on renowned peer-reviewed journals. I also had the opportunity to learn how to teach and mentor students, and to present data at divulgation events and international conferences. The proposed project is a natural extension of

my previous work. It mainly requires expertise in mouse models and MRI, along with strong organizational skills. These are all abilities I possess, enabling me to efficiently manage the project.

Ongoing projects:

1. 5M-2021-23683847 Ministry of Health. *Study of functional brain reconfigurations and therapeutic biomarkers in a preclinical model of multiple sclerosis*. Role: PI.
01/07/2023 - 30/06/2025
2. UAUT-2021-150003-1 Ministry of Health. *Sex-specific implications of early exposure to anesthesia on neuroapoptosis, neuronal circuits, and behavior*. Role: co-investigator.
01/07/2024 - 30/06/2026

Recently completed projects:

- **Montani C**, Balasco L, Pagani M, Alvino FG, Barsotti N, de Guzman AE, Galbusera A, de Felice A, Nickl-Jockschat TK, Migliarini S, Casarosa S, Lau P, Mattioni L, Pasqualetti M, Provenzano G, Bozzi Y, Lombardo MV, Gozzi A. Sex-biasing influence of autism-associated Ube3a gene overdosage at connectomic, behavioral, and transcriptomic levels. *Sci Adv.* (2024). DOI: 10.1126/sciadv.adg1421.
- **Montani C**, Galbusera A, D'Epifanio B, Ghirardini E, Cornuti S, Pasquin Mariani JCR, De Guzman E, Mandrup Bertozzi S, Armirotti A, Baroncelli L and Gozzi A. Connectomic and behavioral alterations in creatine transporter deficiency are partially normalized by gene therapy. Manuscript in revision. DOI: <https://doi.org/10.1101/2024.01.12.575377>.

B. Positions, Scientific Appointments, and Honors

Positions

From 26/04/2023, Researcher at IRCCS Ospedale Policlinico San Martino, Genova (Italy).
From 16/02/2019 to 31/01/2023, Postdoctoral Fellow at IIT-CNCS, Rovereto (Italy).
From 02/05/2016 to 14/02/2019, Postdoctoral Fellow at CIBIO, University of Trento (Italy).
From 01/12/2015 to 30/04/2016, Postdoctoral Fellow at San Raffaele Hospital, Milan (Italy).
From 17/12/2014 to 30/09/2015, Postdoctoral Fellow at Institute of Neuroscience IN-CNR Milan (Italy).
From 01/10/2013 to 16/12/2014, PhD Student at Institute of Neuroscience IN-CNR Milan (Italy).
From 01/11/2010 to 30/09/2011, Predoctoral Fellow at Institute of Neuroscience IN-CNR Milan (Italy).

Scientific Appointments

From 01/07/2023, PI on Grant 5x1000 2020, code 5M-2021-23683847, title: "Study of functional reconfigurations and therapeutic biomarkers in a preclinical model of multiple sclerosis".

2025 - Review activity for ENeuro

2024 - Review activity for Molecular Autism

2020 - Review activity for Journal of translational medicine

Honors

21-24/09/2024 - Invited Speaker at 37th ECNP Congress (Milan, Italy)

23-26/10/2013 - Invited Speaker at SIF Congress (Turin, Italy)

2018 - Early Career Member Bursary, Biochemical Society

09/2005 – 02/2006 Erasmus Scholarship

C. Contributions to Science

1. My early scientific contribution has been focused on how genetic mutations related to neurodevelopmental disorders affect brain cell function and morphology. In Dr. Carlo Sala Laboratory, at CNR Institute of Neuroscience (Milan, Italy), I have investigated the role of Shank3, IL1RAPL1 and eEF2K genetic alterations in neuron maturation, protein-protein

expression and interaction, neurotransmitter release, neuron physiology and mice behavior. I used multiple biological approach, including molecular biology techniques, biochemical and immunocytochemical assays on rodent neuronal primary culture and human iPS cells, to dissect the molecular mechanisms by which alterations of target genes can contribute to autism pathophysiology. We described loss-of-function mutations of IL1RAPL1 gene that prevent its production or change its activity. We delineated the role of mutant proteins in regulating synaptic and dendrite morphology. Specifically, we have demonstrated that IL1RAPL1 protein regulates dendrite complexity in mouse hippocampus and mediates the activity of IL-1 β on dendrite morphology. We have also characterized the synaptic consequences of three novel IL1RAPL1 human mutations in mice and human iPS cells. These data will possibly contribute to the identification of novel therapeutic targets for patients carrying mutations in IL1RAPL1 gene.

- a. Verpelli C, **Montani C**, Vicidomini C, Heise C, Sala C. Mutations of the synapse genes and intellectual disability syndromes. *European Journal of Pharmacology* (2013). DOI: 10.1016/j.ejphar.2013.07.023.
- b. Ramos-Brossier M*, **Montani C***, Lebrun N, Gritti L, Martin C, Seminatore-Nole C, Toussaint A, Moreno S, Poirier K, Dorseuil O, Chelly J, Hackett A, Gecz J, Bieth E, Faudet A, Heron D, Frank Kooy R, Loeys B, Humeau Y, Sala C, Billuart P (* Co-first authors). Novel IL1RAPL1 mutations associated with intellectual disability impair synaptogenesis. *Human Molecular Genetics* (2014). DOI: 10.1093/hmg/ddu523.
- c. **Montani C**, Ramos-Brossier M, Ponzoni L, Gritti L, Cwetsch AW, Braida D, Saillour Y, Terragni B, Mantegazza M, Sala M, Verpelli C, Billuart P, Sala C. The X-Linked Intellectual Disability Protein IL1RAPL1 Regulates Dendrite Complexity. *J Neurosci.* (2017). DOI: 10.1523/JNEUROSCI.3775-16.2017.
- d. **Montani C**, Gritti L, Beretta S, Verpelli C, Sala C. The Synaptic and Neuronal Functions of the X-Linked Intellectual Disability Protein Interleukin-1 Receptor Accessory Protein Like 1 (IL1RAPL1). *Dev Neurobiol.* (2019). DOI: 10.1002/dneu.22657.

I have collaborated to a study aimed at characterizing the function of eEF2K/eEF2 pathways in neurons, with major focus on how the pharmacological and genetic inhibition of eEF2K can revert the epileptic phenotype in a mouse model of human epilepsy. Our results revealed a potential novel target for antiepileptic drugs.

- e. Heise C, Taha E, Murru L, Ponzoni L, Cattaneo A, Guarnieri F, **Montani C**, Mossa A, Vezzoli E, Ippolito G, Zapata J, Barrera I, Ryazanov A, Cook J, Poe M, Stephen M, Kopanitsa M, Benfante R, Rusconi F, Braida D, Francolini M, Proud C, Valtorta F, Passafaro M, Sala M, Bachi A, Verpelli C, Rosenblum K and Sala C. eEF2K/eEF2 Pathway Controls the Excitation/Inhibition Balance and Susceptibility to Epileptic Seizures. *Cerebral Cortex* (2016). DOI: 10.1093/cercor/bhw075.

2. As postdoctoral fellow, I focused my attention on neuronal physiology. At San Raffaele Hospital, at the laboratory of Dr. Stefano Taverna, I was trained on *in vitro* Electrophysiology. Later on, at the laboratory of Professor Giovanni Piccoli at CIBIO (University of Trento, Trento, Italy), we combined *in vivo* study of neurotransmitter release with fluorescent sensors, biochemical and electrophysiological analyses to demonstrate that cryopreserved cortical primary cultures are viable and mature. The core of this period's contribution is the development of novel protocols and technologies to study brain cell activity and mechanisms of synaptic transmission.

- a. Pischedda F, **Montani C**, Obergasteiger J, Frapporti G, Corti C, Rosato Siri M, Volta M and Piccoli G. Cryopreservation of Primary Mouse Neurons: The Benefit of Neurostore Cryoprotective Medium. *Front. Cell. Neurosci.* (2018). DOI: 10.3389/fncel.2018.00081.

In collaboration with the University of Genova and Padova, we have investigated how kinase and GTPase protein activities impact on synaptic vesicle dynamics.

- b. Marte A, Russo I, Rebosio C, Valente P, Belluzzi E, Pischedda F, **Montani C**, Lavarello C, Petretto A, Fedele E, Baldelli P, Benfenati F, Piccoli G, Greggio E, Onofri F. Leucine-rich repeat kinase 2 phosphorylation on synapsin I regulates glutamate release at pre-synaptic sites. *J Neurochem.* (2019). DOI: 10.1111/jnc.14778.

3. When I joined the Functional Neuroimaging Laboratory coordinated by Dr. Alessandro Gozzi at IIT (Rovereto, Italy), my scientific background was enriched by means of system biology techniques and computational skills for MRI scan analysis. *In vivo* MRI coupled with behavioral testing has provided me with a broad perspective on large-scale brain function and structure, complementing my expertise in molecular and physiological processes. First, I collaborated in the study of neural circuitry recruited by acute and repeated intranasal oxytocin administration in mice.

- a. Pagani M, De Felice A, **Montani C**, Galbusera A, Papaleo F, Gozzi A. Acute and Repeated Intranasal Oxytocin Differentially Modulate Brain-wide Functional Connectivity. *Neuroscience*. (2020). DOI: 10.1016/j.neuroscience.2019.12.036.

Then, we combined pharmacological treatment and MRI in rodents for the evaluation of novel therapeutic molecules. Our data revealed how a muscarinic agonist of interest for cognitive impairment, mood disturbances, and psychosis, influences brain functional activity.

- b. **Montani C**, Canella C, Schwarz A, Li J, Gilmour G, Galbusera A, Wafford K, Gutierrez-Barragan D, McCarthy A, Shaw D, Knitowski K, McKinzie D, Gozzi A, Felder C. The M1/M4 preferring muscarinic agonist xanomeline modulates functional connectivity and NMDAR antagonist-induced changes in the mouse brain. *Neuropsychopharmacology* (2021). DOI: 10.1038/s41386-020-00916-0.

Finally, my scientific contribution has been focused on the investigation of sex-specific phenotypes in mouse models of autism and rare diseases. We have described how the autism-linked Ube3a gene exert a sex-specific effect on the connectome, transcriptome and behavior. We are about to publish a study on the effects of gene therapy on behavior and connectivity in a rare disease mouse model.

- c. **Montani C**, Balasco L, Pagani M, Alvino FG, Barsotti N, de Guzman AE, Galbusera A, de Felice A, Nickl-Jockschat TK, Migliarini S, Casarosa S, Lau P, Mattioni L, Pasqualetti M, Provenzano G, Bozzi Y, Lombardo MV, Gozzi A. Sex-biasing influence of autism-associated Ube3a gene overdosage at connectomic, behavioral, and transcriptomic levels. *Sci Adv*. (2024). DOI: 10.1126/sciadv.adg1421.
- d. **Montani C**, Galbusera A, D'Epifanio B, Ghirardini E, Cornuti S, Pasquin Mariani JCR, De Guzman E, Mandrup Bertozzi S, Armirotti A, Baroncelli L and Gozzi A. Connectomic and behavioral alterations in creatine transporter deficiency are partially normalized by gene therapy. Manuscript in revision. DOI: <https://doi.org/10.1101/2024.01.12.575377>.

Complete List of Published Work:

<https://scholar.google.com/citations?user=mhP251oAAAAJ&hl=it>