

CURRICULUM VITAE

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Postdoctoral Fellow

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CURRENT POSITION

December 2021 – present: Postdoctoral fellow, Albert Einstein College of Medicine, NY.

EDUCATION

2013 - 2021 – PhD in Neuroscience, Albert Einstein College of Medicine, NY

Thesis Advisor: Pablo E. Castillo, M.D., PhD, Department of Neuroscience.

Thesis Title: *Novel Cellular and Synaptic Mechanisms Implicated at the Hippocampal Mossy Fiber System*

2010-2012: M.A. in Neuropsychobiology. Università degli Studi di Cagliari, Italy.

Thesis Advisor: Enrico Sanna, Ph.D.

2010: B.A. in experimental biology, Università degli Studi di Cagliari, Italy.

Thesis Advisor: Giovanni Floris, Ph.D

RESEARCH EXPERIENCE

Dec 2021-present: Postdoctoral Fellow, Laboratory of Dr. Stephanie Rudolph, Albert Einstein College of Medicine, NY

Characterization of cerebellar outputs combining *in vitro* electrophysiology, 2-photon and confocal microscopy with in situ hybridization and neuronal tracing methods.

2014-2021: PhD in the Laboratory of Dr. Pablo Castillo, Albert Einstein College of Medicine, NY

Studies on synaptic transmission and plasticity in acute hippocampal slices

Electrophysiological and optical analysis of the molecular basis of bidirectional NMDAR plasticity in the hippocampus

Characterization of the properties of kainate receptors and auxiliary proteins at hippocampal synapses

Investigation of the role of *Nurr1* in synaptic transmission and plasticity

Molecular mechanisms of retrograde suppression of presynaptic Post-tetanic potentiation

2014

4 months rotation, Laboratory of Kamran Khodakhah, PhD, Department of Neuroscience, Albert Einstein College of Medicine, NY, USA,

in vivo characterization of cortical spreading depression in mice.

2013: 2 months rotation, Laboratory of José Lu s Pe a, PhD, Department of Neuroscience, Albert Einstein College of Medicine, NY, USA, *in vitro* studies on synaptic plasticity in the avian forebrain.

2010-2012: Master's degree Internship with Dr. Enrico Sanna, Ph.D., Universit  degli Studi di Cagliari, Italy. *In vitro* and behavioral analysis of the effect of food restriction on the endocannabinoid-mediated remodeling of excitatory synaptic transmission in the hippocampus and prefrontal cortex; studies on the effect of progesterone treatment on mice exposed to social isolation.

TECHNICAL SKILLS

Electrophysiology

- wide expertise with most types of *in vitro* electrophysiology recordings including: whole-cell patch clamp, field recordings, perforated patch-clamp, paired recordings, optogenetic and chemogenetic manipulations, single-cell electroporation, *in situ* hybridization (HCR) in acute thick slices in combination with electrophysiology.

2-photon fluorescence microscopy in vitro

- analysis of activity-dependent dendritic spine calcium signaling in acute hippocampal slices and morphological reconstruction of neuronal structures
- 2-photon uncaging stimulation of calcium signals and currents on dendrites and dendritic spines

In vivo fiber photometry

- Single and dual wavelength fiber photometry in freely behaving and head-fixed mice

Other microscopy techniques

- Confocal microscopy (Leica SP8, Zeiss LSM880 Airyscan)
- Slide scanner (AxioScan)
- Light sheet microscopy (Smart SPIM system)

Stereotactic surgeries

- *in vivo* delivery of viral and nonviral agents for subsequent *in vitro* analysis
- implants for *in vivo* single/multi-units and EEG recordings and fiber photometry in freely behaving and head-fixed mice
- Implants for simultaneous optogenetic stimulation, *in vivo* electrophysiology and pupillometry measurements

Neuronal circuit tracing

- well versed with most forms of neuronal tracing including: antero- and retrograde labeling using AAV-vectors, Rabies viruses; identification of multisynaptic circuits using transsynaptic labeling and cre-dependent tracing of inputs and outputs of specific brain areas (TRIO, cTRIO)

Molecular Biology

- Fluorescence *in situ* Hybridization (Hybridization Chain Reaction HCR) in acute thick and fixed brain slices
- PCR

Biochemistry

- basic expertise for western blot and co-immunoprecipitation

Histology

- immunostaining in fixed and acute brain slices.
- brain clearing using SHIELD technique.

Coding

- basic knowledge of MatLab and Python programming language

Animal handling

- Experience with mice and rats handling and common animal procedures including intraperitoneal and subcutaneous injections, and transcardial perfusion.

TEACHING EXPERIENCE

Aug-Nov 2018 Teaching assistant for the Cellular and Molecular Neuroscience class of the Neuroscience Graduate Program at Albert Einstein College of Medicine. Required both collective and individual training sessions.

Aug-Nov, 2020 Teaching assistant for the Principles of Neuroscience I (individual sessions)

Invited Talk and Lectures

October 2021: Invited Lecturer at Fordham University. Lecture title *“Pre- and postsynaptic mechanisms of short- and long-term synaptic plasticity”*

October 2023: Invited Lecturer at Fordham University. Lecture title *“Neuronal circuits: why and how do we study them?”*

Honors and Awards

April 2022: Bioluminescence North America (BINA) Award recipient to attend the 2022 MBL Light Sheet Fluorescence Microscopy Conference

December 2021: “Dan and Sheryl Tishman Fellowship” postdoc awardee at Albert Einstein College of Medicine, NY.

May 2016: UT Austin Conference on Learning and Memory Travel Award

2012: Best Graduates Award from Università degli Studi di Cagliari

2012: M.S. Magna Cum Laude

2010: B.A Magna Cum Laude

Scientific Leadership

President of Departmental Journal Club “Club Syn” (Einstein College)

Organizer of Student-Invited Speaker Events (Einstein College)

PUBLICATIONS

Original Research Articles

Dazzi L, Talani G, Biggio F, Utzeri C, Lallai V, Licheri V, **Lutzu S**, Mostallino MC, Secci PP, Biggio G, Sanna E.

Involvement of the Cannabinoid CB1 Receptor in Modulation of Dopamine Output in the Prefrontal Cortex Associated with Food Restriction in Rats.

PLoS ONE. Volume: 9. Year: 2014

Kalinowska M, Chávez AE, **Lutzu S**, Castillo PE, Bukauskas FF, Francesconi A.

Actin-4 Governs Dendritic Spine Dynamics and Promotes Their Remodeling by Metabotropic Glutamate Receptors

Journal of Biological Chemistry. Volume: 290. Year:2015

Oh WC, **Lutzu S**, Castillo PE, Kwon HB

De novo synaptogenesis induced by GABA in the developing mouse cortex

Science. Volume: 353. Year: 2016

Park J, Chávez AE, Mineur YS, Morimoto-Tomita M, **Lutzu S**, Kim KS, Picciotto MR, Castillo PE, Tomita S.

CaMKII Phosphorylation of TARPy-8 Is a Mediator of LTP and Learning and Memory.

Neuron. 2016 Oct 5;92(1):75-83. doi: 10.1016/j.neuron.2016.09.002. Epub 2016 Sep 22.

Weng FJ, Garcia RI, **Lutzu S**, Alviña K, Zhang Y, Dushko M, Ku T, Zemoura K, Rich D, Garcia-Dominguez D, Hung M, Yelhekar TD, Sørensen AT, Xu W, Chung K, Castillo PE, Lin Y

Npas4 Is a Critical Regulator of Learning-induced Plasticity at Mossy Fiber-CA3 Synapses During Contextual Memory Formation

Neuron. 2018 Mar 7;97(5):1137-1152.e5. doi: 10.1016/j.neuron.2018.01.026. Epub 2018 Feb 8

Makani S*, **Lutzu S***, Lituma PJ, Hunt DI and Castillo PE.

Retrograde suppression of post-tetanic potentiation at the mossy fiber-CA3 pyramidal cell synapse

eNeuro. 2021 Mar 11;8(2):ENEURO.0450-20.2021. doi: 10.1523/ENEURO.0450-20.2021. Print Mar-Apr 2021

Ramos CR*, **Lutzu S***, Yamasaki M, Yanagawa Y, Sakimura K, Watanabe M, Tomita S and Castillo PE

Activation of extrasynaptic Kainate receptors drives hilar mossy cells activity

J Neurosci. 2022 Apr 6;42(14):2872-2884. doi: 10.1523/JNEUROSCI.0922-21.2022. Epub 2022 Feb 23. *co-first authorship

Lutzu S*, Alviña K*, Puente N, Grandes P and Castillo PE

Target cell-specific plasticity rules of NMDA receptor-mediated synaptic transmission in the hippocampus

Frontiers in Cellular Neuroscience 2023 (accepted - in press) *co-first authorship

Rodenas-Ruano A, Nasrallah K, Lutzu S, Castillo M and Castillo PE

Heterosynaptic NMDA Receptor Plasticity in Hippocampal Dentate Granule Cells

Biorxiv 2022

Lutzu S, and Castillo PE (review article)

Modulation of NMDA receptors by GPCRs: role in synaptic transmission, plasticity and beyond

Neuroscience 2020, Feb 24;S0306-4522(20)30105-6

Català-Solsona J, Lituma PJ, **Lutzu S**, Siedlecki-Wullich D, Fábregas-Ordoñez C, Miñano-Molina AJ, Saura CA, Castillo PE, Rodríguez-Álvarez J

Activity-dependent Nr4a2 induction modulates synaptic expression of AMPA receptors and plasticity via a Ca²⁺/CRT1/CREB pathway

J Neurosci. 2023 Mar 16;JN-RM-1341-22. doi: 10.1523/JNEUROSCI.1341-22.2023. Online ahead of print.

Rudolph S, Badura A, **Lutzu S**, Pathak SS, Thieme A, Verpeut JL, Wagner MJ, Yang YM, Fioravante D.

Cognitive-Affective Functions of the Cerebellum.

J Neurosci. 2023 Nov 8;43(45):7554-7564. doi: 10.1523/JNEUROSCI.1451-23.2023. PMID: 37940582; PMCID: PMC10634583.

Niepoth N, Merritt J, Uminski M, Lei E, **Lutzu S**, Wacker S, Rudolph S, Bendesky A
Genetic causes and phenotypic consequences of a newly evolved adrenal cell type
(submitted 2023)

Carta I, Lutzu S, Arora T, Abdelmesih B, Podda G, Vera G, Yoon YJ, Rudolph S, Autry AE
Sex specific neural substrates in the mouse hypothalamus drive caregiving behavior
(submitted 2023)

Lutzu S, Hyde R, Rentrup K, Rudolph S

Sequential electrophysiological, morphological, and molecular characterization of visually identified neurons

(in preparation 2023)

ABSTRACTS AND POSTER PRESENTATIONS

1. Talani G, **Lutzu S**, Carta I, Cannas F, Saderi D, Porceddu P.F, Corrias A, Trudu F, Masala N, Biggio G. and Sanna E.
Ethanol actions in C57BL/6J mice exposed to social isolation: effect on hippocampal plasticity and role of neurosteroids.
Department of Experimental Biology, Section of Neuroscience Poster Presentation, University of the Studies of Cagliari. Year (2011).
2. **Lutzu S**, Castillo PE.
Assessing the role of cAMP/PKA in presynaptic LTP.
Dominick P Purpura Department of Neuroscience 2014 Retreat. Edith Macy Conference Center, NY.
3. Alviña K, **Lutzu S**, Castillo PE.
Postsynaptic calcium dynamics associated with bidirectional plasticity of NMDA receptor mediated transmission.
Nanosymposium on "Synaptic plasticity: mechanisms and modulation". Society for Neuroscience Meeting. Chicago 2015
4. **Lutzu S**, Alviña K, Castillo PE.
Postsynaptic calcium dynamics associated with bidirectional plasticity of NMDA receptor mediated transmission.
Poster session. Society for Neuroscience Meeting. San Diego 2016
5. **Lutzu S**, Alviña K, Castillo PE.
Assessing molecular mechanisms underlying NMDAR plasticity at hippocampal synapses.
Poster session. Society for Neuroscience Meeting. Chicago 2019