

CURRICULUM VITAE, Dr. Paola Perin

Name: Paola Perin

Date of birth: May 12th, 1970

Place of birth: Viadana (MN), ITALY

Nationality - Italian

CURRENT POSITION (2018) Assistant professor, Dept. Brain and Behavioral Sciences, University of Pavia. PI of the Sensory Encoding Lab. Member of the Neuroimmunology Lab of the Dept. of Molecular Medicine, University of Pavia (PI Prof. Roberto Pizzala)

EDUCATION

1988-1992 – M.Sc. in Biology cum laude, University of Pavia

1992-1996 – Ph.D. in Physiological Sciences, Joint Universities of Pavia, Milan, Genoa, Turin

POSITIONS AND EMPLOYMENT

June-December 1993 - Predoctoral fellowship from the University of Pavia for lab work at Baylor College of Medicine (Houston, TX), PI: Prof. Arthur M. Brown

January-July 1994 - Research Associate, Baylor College of Medicine, Houston (TX)

1997-1998 – Postdoctoral Fellow, Dept. Pharmacology, Tulane University, New Orleans (LA). PI: Prof. Paul S. Guth

1998- Assistant Professor in Physiology, Faculty of Pharmacy, University of Pavia

July-September 1999 - Research Associate, Wayne State University, Detroit (MI). PI: Prof. Dennis G. Drescher

July 2003- February 2005 – Research Associate, University of Chicago, Chicago (IL). PI: Prof. Jay M. Goldberg

PROFESSIONAL MEMBERSHIPS

Scientific societies:

AINI (Associazione Italiana di Neuroimmunologia)

OCNS (Organization for Computational Neuroscience)

ARO (Association for Research in Otolaryngology)

Society for Neuroscience

Charities:

AIT (Associazione Italiana Tinnitus)

AU-TU (Acufene Uniti – Tinnitus United)

EUTI

COST projects:

COST TINNET (2014-2018)

OTHER EXPERIENCE

Reviewer for: Frontiers in Cellular Neuroscience, Frontiers in Immunology, Frontiers in Neuroanatomy, BMC Neuroscience, Journal of Physiology, Trends in Hearing.

Review Editor for Neuro-Otology.
Review Editor for Auditory Cognitive Neuroscience.

Editor for the Frontiers Special Topic: "Neuroimmunology of the inner ear" (2019)

Author in the following textbooks:

Fisiologia: molecole, cellule e sistemi (D'Angelo, Peres), EdiErmes (2010)

Cellule, tessuti, sistemi (Zaccheo, Pestarino), Pearson (2013)

Teacher of the following courses at the University of Pavia:

Anatomy and Cell Physiology (9 CFU, L.M. Pharmacy)

Sensory Physiology and Analysis (3CFU, L.M. Pharmacy/CTF)

Lecturer for the topic "Mechanisms of tinnitus onset" in several Continuing Medical Education courses

Invited speaker in the NEURON School: April 16-21, Alghero (SS, Italy)

DISSEMINATION

Speaker at several open meetings for tinnitus patients sponsored by AIT/AU-TU

GRANTS

Internal Research funding from the Dept. of Molecular Medicine, 2018 (PI: Prof. Roberto Pizzala, 16000 EUR)

Universitiamo crowdfunding campaign, 2017 (PI: Prof. Paola Perin, 17000 EUR)

Donations from AIT Onlus, 2008-2019 (PI: Prof. Paola Perin, 5000-15000 EUR-yr)

Miroglio grant for the project "Study of afferent transmission in vestibular organs", 2011 (PI: Prof. Paola Perin, 10000 EUR)

MURST Cofinancing extension 2005-2008: "Processes determining the sensory discharge dynamics in semicircular canals". PI Prof. Paola Perin

NIH R01 grant 2002-2007 "Cellular mechanisms of the vestibular system": PI: Prof. J. Goldberg

MURST Project 2002-2004: "Presynaptic modulation of transmitter release at the hair cell afferent synapse". PI: Prof. P. Valli

SCIENTIFIC EXPERTISE

Electrophysiology:

Whole-cell patch clamp (ruptured and perforated);

Capacitance measurements;

Oocyte recording;

Stimulation and recording from peripheral vestibular organs;
Brain and sensory organ slices

Computational neuroscience:

Neuronal modeling with NEURON;
Dynamic analysis of complex systems;
MATLAB;
Python

Histology

Anatomy and histology of the nervous system and inner ear;
Immunofluorescence;
iDISCO;
Temporal bone imaging;
Stereology;
Image analysis

Other

Ca²⁺-imaging;
RT-PCR
Rodent behavioural testing
Tinnitus

SCIENTIFIC INTERESTS

My scientific interest has been focused on signal transmission in sensory systems, and in particular signal encoding and synaptic transmission in the auditory and vestibular system. For the first part of my career, I mainly studied signal processing by vestibular hair cells, especially as regards the influence of ion channels and Ca²⁺ on response dynamics. However, my current main research topic is the central auditory system, and in particular neuroimmune interactions affecting it in health and pathology. Currently I am on a pretty interesting detour following the ins and out of brain macrophages, and where they move upon neuroinflammation. The main question I would like to solve is what are the signals that say that a neural activity pattern is “wrong” in the auditory system and trigger plastic changes in the neuronal circuits. Answering this question will help treating disorders such as tinnitus, where maladaptive plasticity appears to be key.

PUBLICATIONS:

- 1 Perin P, Venturino A, Vitale V, Bertone V, Sanchini G, Oda A, Colombo G, Pizzala R. Responses of Iba1+ cells in the rat cochlear nuclei and choroid plexus after unilateral cochlear ablation: is the DCN a neuroimmune hub? Submitted.
- 2 Perin P, Voigt F.F., Bethge P., Helmchen F., Pizzala R. (2019) iDISCO+ for the study of neuroimmune architecture of the rat auditory brainstem. *Frontiers in Neuroanatomy*, in press.
- 3 Perin P, Ceccarini M, Centineo A, Pizzala R. (2018) Choroid plexus association to the auditory system: observations in a clarified brainstem-inner ear preparation, 55th Workshop on Inner Ear Biology, September 6-8th, Berlin.

- 4 Perin P, Ceccarini M, Centineo A, Pizzala R. (2018) Segmentation and cell feature extraction in the clarified auditory system 55th Workshop on Inner Ear Biology, September 6-8th, Berlin.
- 5 Ceccarini M, Centineo A, Perin P, Pizzala R. (2018) Reconstruction of neuroimmune communication pathways between the cochlea and the 4th ventricle, XXVII AINI CONGRESS, May 8-11, Trieste.
- 6 Centineo A, Ceccarini M, Perin P, Pizzala R (2018) Stereological analysis of Iba1+ cells in clarified brain regions, XXVII AINI CONGRESS, May 8-11, Trieste.
- 7 Perin P, Ceccarini M, Centineo A, Pizzala R (2018) A clarified rat cochlea – brainstem preparation for the visualization of inflammation spread after ototoxic treatment, XXVII AINI CONGRESS, May 8-11, Trieste.
- 8 Perin P (2018), A clarified cochlea-auditory brainstem preparation for the visualization of inflammation spread after ototoxic treatment. Lightsheet microscopy workshop, March 19-20, Wyss Center, Geneva
- 9 Perin P, Venturino A, Ceccarini M, Centineo A, Pizzala R (2018), Neuroinflammatory responses in choroid plexus and dorsal cochlear nuclei after unilateral cochlear damage. TRI/TINNET Meeting, March 14-16, Regensburg
- 10 Perin P, Pizzala R (2017), Age-related changes in cochlear nuclei microglia and macrophages in the rat. 54th Workshop on Inner Ear Biology, September 13-16th, Hannover
- 11 Perin P, Venturino A, Pizzala R (2017) Choroid plexus trafficking of immune cells towards the rat cochlear nuclei after noise trauma or cochlear destruction XIII European Meeting on Glial Cells in Health and Disease July 8 –11th, Edimburgh
- 12 Venturino A; Colombo G; Sanchini G; Vitale V; Bertone V; Oda A; Pizzala R; Perin P. (2016) Does blocking microglial activation prevent tinnitus onset? *Journal of Neuroimmune Pharmacology*; 11:1, #16
- 13 Vitale V, Sanchini G, Solinas S, Pizzala R, Perin P (2016) Microglial subpopulations in rat DCN and their changes in tinnitus models Inner Ear Biology Workshop, September 17-21st, Montpellier
- 14 Perin P, Venturino A, Sanchini G, Vitale V, Pizzala R (2016) Microglial functional state modulation and tinnitus onset: comparison of different rat models. FENS Forum, July 5-9th, Copenhagen
- 15 Perin P, Venturino A, Solinas S, Bertone V, Pizzala R (2016) DCN microglia in rat tinnitus models: density, activation and possible roles. TRI/TINNET Meeting, March 15-18th, Nottingham (UK)
- 16 Perin P, Pizzala R, Oda A, Colombo G. Capetta A, Sanchini G, Vitale V, Venturino A (2015) Does blocking microglial activation prevent tinnitus onset? 52nd Workshop on Inner Ear Biology Workshop, August 30th-September 2nd, Rome
- 17 Gallus S, Lugo A, Garavello W, Bosetti C, Santoro E, Colombo P, Perin P, La Vecchia C, Langguth B. Prevalence and Determinants of Tinnitus in the Italian Adult Population. *Neuroepidemiology*. 2015;45(1):12-9. doi: 10.1159/000431376.
- 18 Perin P, Venturino A, Oda A, Capetta A, Colombo G, Sanchini G, Vitale V, Bertone V, Pizzala R. (2015)Microglia changes in rat dorsal cochlear nucleus correlate to behavioural tinnitus evidence. XII European Meeting on Glial Cells in Health and Disease, July 15–18th 2015, Bilbao
- 19 Venturino A, Oda A, Perin P. Hair cell-type dependent expression of basolateral ion channels shapes response dynamics in the frog utricle. *Front Cell Neurosci*. 2015 Sep 7;9:338.

- 20 Subramaniam S, Solinas S, Perin P, Locatelli F, Masetto S, D'Angelo E. Computational modeling predicts the ionic mechanism of late-onset responses in unipolar brush cells. *Front Cell Neurosci.* 2014 Aug 20;8:237.
- 21 Venturino A, Rizza M, Pedrazzoli M, Perin P (2013). Trying hard not to listen: the evolution of information processing in vestibular hair cells. *CNS meeting 2013, Paris.*
- 22 Subramaniam S, Perin P, Solinas S, D'Angelo E (2013) The mechanisms of late-onset synaptic responses in a realistic model of Unipolar Brush Cells. *CNS meeting 2013, Paris.*
- 23 Venturino A, Barbaro S, Oda A, Boselli C, Ferraro D, Pizzala R, Perin P (2013). Microglia in the rat cochlear nuclei: a player in tinnitus-related circuit reorganization? *TRI Meeting 2013, Valencia.*
- 24 Perin P, Botta L, Tritto S, Laforenza U (2012). Expression and localization of ryanodine receptors in the frog semicircular canal, *J Biomed Biotechnol.* vol. 2012, Article ID 398398, 6 pages, 2012. doi:10.1155/2012/398398.
- 25 Perin P., Venturino A., Tritto S., Mansi R., Laforenza U (2012). Resonance and release shape afferent responses in the frog utricle. *Fens forum 2012, Barcelona.*
- 26 Andreescu CE, Prestori F, Brandalise F, D'Errico A, De Jeu MT, Rossi P, Botta L, Kohr G, Perin P, D'Angelo E, De Zeeuw CI (2011) NR2A subunit of the N-methyl D-aspartate receptors are required for potentiation at the mossy fiber to granule cell synapse and vestibulo-cerebellar motor learning. *Neuroscience*;176:274-83.
- 27 Nigro MJ, Perin P, Magistretti J (2011) Differential effects of Zn²⁺ on activation, deactivation, and inactivation kinetics in neuronal voltage-gated Na⁺ channels. *Pflugers Arch.* 2011 Aug;462(2):331-47.
- 28 Perin P, Caldirola E, Cofrancesco P, Marini A (2011) Monitoring academic progress in a Faculty of Pharmacy, *Je-LKS*, v.7, n.1, 31-40.
- 29 Subramaniam S, Perin P, Solinas S, D'Angelo E (2011) Modeling UBC intrinsic excitability *BMC Neurosci.* vol. 12, pp. 1-2.
- 30 Perin P, Tritto S, Botta L, Fontana JM, Gastaldi G, Masetto S, Tosco M, Laforenza U (2010) Aquaporin-6 expression in the cochlear sensory epithelium is downregulated by salicylates. *J Biomed Biotechnol.* Epub 2010 Jan 12.
- 31 Perin P, Lucchelli A (2010) I farmaci ototossici. *Tema Farmacia Anno XXVIII*, n.5, maggio 2010
- 32 Mansi R. Perin P.(2010) How Do Hair Cell Currents Shape Afferent Responses in the Frog Vestibular Organs? In: *ARO Meeting. Anaheim CA*
- 33 Perin P., Tritto S., Botta L., Laforenza U., Gastaldi G., Valli P. (2008). Salicylates Decrease AQP6 Expression in the Mouse Organ of Corti. In: *ARO Abstracts 2008. Phoenix, AZ, 16-21 Feb 2008*
- 34 Tritto S, Botta L, Laforenza U, Gastaldi G, Valli P, Perin P. (2008). Salicylates decrease AQP6 expression in the mouse organ of Corti. In: *45th Inner Ear Biology Workshop. Ferrara, 21 - 24 settembre 2008*
- 35 Botta L, Tritto S, Perin P, Laforenza U, Gastaldi G, Zampini V, Zucca G, Valli S, Masetto S, Valli P. (2008). Histamine H1 receptors are expressed in mouse and frog semicircular canal sensory epithelia. *Neuroreport* 19; p. 425-429.

- 36 Tritto S, Botta L, Laforenza U, Gastaldi G, Perin P. (2007). Localization of calcium stores in the frog labyrinth. In: Segnali di Calcio in Piemonte. Novara
- 37 Perin P., D'Angelo E (2006) Electrotonic analysis of UBCs. In The node and the network, Pavia
- 38 Catacuzzeno L, Fioretti B, Perin P, Franciolini F (2004). Spontaneous low-frequency voltage oscillations in frog saccular hair cells. *J Physiol* vol. 561, pp. 685-701.
- 39 Perin P., Pascale A, Amadio M, Botta L, Valli P (2004). Voltage-dependent and store-mediated Ca²⁺ sources in frog vestibular hair cells. In: ARO meeting. Daytona Beach FL
- 40 Perin P. (2003). Calcium channels and exocytosis in frog vestibular hair cells. In: Vestibular Pharmacology Symposium, Neuroscience Meeting. New Orleans.
- 41 Catacuzzeno L, Fioretti B, Perin P, Franciolini F (2003). Frog saccular hair cells dissociated with protease VIII exhibit inactivating BK currents, K(V) currents, and low-frequency electrical resonance. *Hearing res.* vol. 175, pp. 36-44.
- 42 Lelli A, Perin P, Martini M, Ciubotaru CD, Prigioni I, Valli P, Rossi ML, Mammano F (2003). Presynaptic calcium stores modulate afferent release in vestibular hair cells. *J Neurosci.* vol. 23, pp. 6894-6903.
- 43 Masetto S, Bosica M, Correia MJ, Ottersen OP, Zucca G, Perin P, Valli P. (2003). Na⁺ currents in vestibular type I and type II hair cells of the embryo and adult chicken. *J Neurophysiol* vol. 90, pp. 1266-1278.
- 44 Ramahrishnan NA, Green GE, Pasha R, Drescher MJ, Swanson GS, Perin P, Lakhani RS, Ahsan SF, Hatfield JS, Khan KM, Drescher DG. (2002). Voltage-gated Ca²⁺ channel Cav1.3 subunit expressed in the hair-cell epithelium of the sacculus of the trout *Oncorhynchus mykiss*: cloning and comparison across vertebrate classes. *Mol Brain Res.* vol. 109, pp. 69-83.
- 45 Perin P., Pascale A, Pace J, Valli P (2002). Presynaptic Ca channels in frog canal hair cells. In: Barany Satellite Meeting. Orcas Island
- 46 Perin P., Masetto S, Valli P (2002). Differential expression of voltage-dependent currents by hair cells from the frog utricle and canal. In: ARO Meeting. St. Petersburg FL
- 47 Botta L, Valli P, Asti A, Perin P, Zucca G., Racchi M., Govoni S., Pascale A. (2001). beta amyloid-induced disruption of ionic balance: studies on the isolated frog labyrinth. *NEUROREPORT.* vol. 12, pp. 2493-2497.
- 48 Holt JC, Lioudyno M, Athas G, Garcia MM, Perin P, Guth PS (2001). The effect of proteolytic enzymes on the alpha9-nicotinic receptor-mediated response in isolated frog vestibular hair cells. *Hearing Res.* vol. 152, pp. 25-42.
- 49 Perin P., Masetto S., Martini M, Rossi ML, Rubbini G, Rispoli G, Guth PS, Zucca G, Valli P (2001). Regional distribution of calcium currents in frog semicircular canal hair cells. *Hearing Res.* vol. 152, pp. 67-76.
- 50 Perin P., Masetto S, Zucca G, Valli P (2001). Sodium currents in spherical hair cells from the frog utricle and lagena. In: ARO Meeting. St Petersburg FL
- 51 Perin P., Masetto S, Zucca G, Valli P (2001). Current expression patterns in hair cells from the frog utricle. In: Symposium: "Signal transduction in the auditory system". Goettingen, Germany

- 52 Masetto S, Malusà, Perin P., Zucca G, Valli P (2001). Depolarization-activated inward currents in type II hair cells of the chick semicircular canal during embryonic development. In: ARO Meeting. St. Petersburg FL
- 53 Ramakrishnan N.A, Swanson G.J, Perin P., Pasha R, Myers S.F, Drescher D.G (2001). Functional analysis of an N-type, alpha-1B calcium channel coding sequence from the vestibular hair-cell layer of the trout sacculus. In: ARO Meeting. St. Petersburg FL
- 54 Botta L, Mira E, Valli S, Zucca G, Perin P, Benvenuti C, Fossati A, Valli P (2000). Effects of betahistine metabolites on frog ampullar receptors. *Acta Otolaryngol.* vol. 120, pp. 25-27.
- 55 Masetto S, Perin P, Malusà A, Valli P (2000). Membrane properties of chick semicircular canal hair cells in situ during embryonic development. *J Neurophysiol.* vol. 83, pp. 2740-2756.
- 56 Perin P, Soto E, Vega R, Botta L, Masetto S, Zucca G, Valli P (2000). Calcium channels functional roles in the frog semicircular canal. *Neuroreport* vol. 11, pp. 417-420.
- 57 Perin P., Soto E, Botta L, Masetto S, Zucca G., Valli P (2000). Functional roles of voltage-operated calcium channels in the frog semicircular canal. In: ARO Meeting. St. Petersburg FL
- 58 Zucca G, Botta L, Valli S, Giannoni B, Mira E, Perin P, Buizza A, Valli P (1999). Effects of caloric stimuli on frog ampullar receptors. *Hearing Res.* vol. 37, pp. 8-14.
- 59 Zucca G, Botta L, Valli S, Giannoni B, Mira E, Perin P, Valli P (1999). Caloric stimulation of ampullar receptors: a new method to produce mechanically-evoked responses in frog semicircular canals. *J Neurosci Meth.* vol. 88, pp. 141-151.
- 60 Perin P., Masetto S, Valli P (1999). Voltage-operated calcium channels in frog vestibular hair cells. In: SIF meeting. Rome
- 61 Perin P., Masetto S, Valli P, Guth P.S (1999). Regional distribution of voltage-operated calcium channels in the frog vestibular organs. In: ARO Meeting. St. Petersburg FL
- 62 Botta L, Mira E, Valli S, Perin P, Zucca G, Valli P (1998). Effects of Betahistine on vestibular receptors of the frog. *Acta Otolaryngol.* vol. 118, pp. 519-523.
- 63 Guth PS, Holt JC, Perin P, Athas G, Garcia M, Puri A, Zucca G, Botta L, Valli P (1998). The metabotropic glutamate receptors of the vestibular organs. *Hearing Res.* vol. 125, pp. 154-162.
- 64 Guth PS, Perin P, Norris CH, Valli P (1998). The vestibular hair cell: post-transductional signal processing. *Prog Neurobiol.* vol. 54, pp. 193-247.
- 65 Norris CH, Miller AJ, Perin P, Holt JC, Guth PS (1998). Mechanisms and effects of transepithelial polarization in the isolated semicircular canal. *Hearing Res.* vol. 123, pp. 31-40.
- 66 Zucca G, Valli S, Valli P, Perin P, Mira E (1998). Why do benign paroxysmal positional vertigo (BPPV) episodes recover spontaneously?. *J Vestib Res.* vol. 8, pp. 325-329.
- 67 Guth P.S, Zucca G, Botta L, Perin P., Holt J.C, Puri A, Valli P (1998). The pharmacology of the metabotropic glutamate receptor of frog semicircular canal. In: ARO Meeting,. St. Petersburg FL

- 68 Masetto S, Perin P., Malusà, Zucca G, Valli P (1998). Development of basolateral potassium currents in semicircular canal hair cells of the chick embryo. In: *Pfluegers Arch.*, vol. 435, p. R9
- 69 Guth P.S, Perin P., Norris C.H, Puri A, Botta L, Zucca G, Valli P (1997). mGluR-mediated facilitation of the hair cell-afferent synapse in frog semicircular canal (Neuroscience Meeting, New Orleans, abstr. 888.14).
- 70 Norris, C.H., Perin P., Miller A (1997). Responses to endolymphatic polarization in the isolated semicircular canal. In: 34th workshop on inner ear biology, Rosa Marina, ITALY
- 71 Mira E, Valli S, Masetto S, Perin P., Valli P (1996). Ion mechanisms involved in receptor current flow in vestibular hair cells. In: Barany Society Meeting. Sydney
- 72 Masetto S, Perin P., Botta L, Zucca G, Valli P (1996). Ion channels involved in frog vestibular sensory adaptation. In: Gordon Research Conference. New London, New Hampshire
- 73 Toselli M, Perin P, Taglietti V. (1995). Muscarine inhibits w-conotoxin-sensitive calcium channels in a voltage- and time-dependent mode in the human neuroblastoma cell line SH-SY5Y. *J Neurophysiol.* vol. 74, pp. 1730-1741.

FURTHER INFORMATION ON THE WEB

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