

## EMANUELA COLLA PhD

### **Present Affiliation**

Associate Professor  
Department of Human Sciences and Promotion of Quality of Life,  
San Raffaele Open University, Rome

Instructor  
Applied Biomedical Engineering Master's program, Engineering for Professionals,  
Whiting School of Engineering, Johns Hopkins University, Baltimore MD USA

### **Research interest**

Pathogenesis of  $\alpha$ -synucleinopathies, Parkinson's Disease, Neurodegeneration.

### **Education**

Ph.D. in Molecular Biology and Pathology, University of Parma, Italy, 2004.  
Thesis title: Mechanisms of cell response to hypertonic stress and inflammation. PhD Thesis Advisors: Prof HM Kwon, PhD (UMB/JHMI); Prof R Sala, MD PhD (University of Parma).

M.S. (Laurea) in Biological Sciences, Molecular Biology major, summa cum laude, at the University of Parma, Italy, 1999.  
Thesis title: Transporters of cationic amino acids in human endothelial cells and regulation by Lipopolysaccharide. Thesis Advisors: Prof R. Sala PhD and Prof. R. Franchi-Gazzola MD (University of Parma).

### **Work and Research Experience**

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| 06/15/23- present | Associate Professor, Department of Human Sciences and Promotion of Quality of Life, San Raffaele Open University, Rome   |
| 01/2021- 06/14/23 | Assistant Professor (Ricercatore TD A) SSD BIO/09<br>Bio@SNS Laboratory of Biology, Scuola Normale Superiore, Pisa Italy   |
| 01/2020- present  | Instructor<br>Applied Biomedical Engineering Program, Engineering for Professionals,<br>Whiting School of Engineering, Johns Hopkins University, Baltimore MD USA. |
| 03/2018-12//2021  | CEO and founder Colla Consulting LLC. Roseland, NJ, USA.   |
| 12/2017 - 11/2018 | Scientific Collaborator<br>Bio@SNS Laboratory, Scuola Normale Superiore, Pisa Italy  |
| 09/2011-10/2017   | Assistant Professor (Ricercatore TD) SSD BIO/11<br>Bio@SNS, Laboratory of Biology, Scuola Normale Superiore, Pisa, IT.   |
| 08/2004-03/2010   | Postdoctoral fellow<br>Division of Neuropathology, Johns Hopkins School of Medicine, Baltimore MD, USA.  |

## **Teaching**

- Fundamentals of biological system, 1<sup>st</sup> year college students, degree in Sport Science. CFU 7 (course instructor) since 2023;
- Experimental Design, 1<sup>st</sup> year graduate students, PhD in Neuroscience SNS since 2020., CFU 6 (course instructor);
- Seminars in Neuroscience, 1<sup>st</sup> year graduate students, PhD in Neuroscience SNS since 2020. Module: 20 hrs CFU 6 (course instructor);
- Methods in Neurobiology, Applied Biomedical Engineering Program, Engineering for Professionals Whiting School of Engineering, Johns Hopkins University since 2020. CFU 3 Online class. Module 14 hrs (course instructor);
- Experimental Design, 1<sup>st</sup> year graduate students, PhD in Neuroscience SNS 2016-2017. CFU 6 (didattica integrativa)
- Experimental Laboratory I, 2<sup>nd</sup> year undergraduate students, Baccalaureate in Biology SNS 2016-2017. CFU 3 (didattica integrativa);
- Experimental Laboratory II, 1<sup>st</sup> year graduate students, Master in Biology SNS, 2012-2013, 2015-2016, 2014-2015 and 2012-2013. CFU 3 (didattica integrativa);

## **Speaker at national and international meetings, workshops and retreats**

- AD/PD meeting Goteborg, Sweden 2023. Colonic organotypic cultures isolated from a prodromal PD mouse model show abnormal electrical activity linked to a sustained Ca<sup>2+</sup> signaling.
- The gut-brain axis in the pathogenesis of Parkinson's Disease. Department of Pharmacy and Biotechnology, UNIBO 2023.
- Alpha-synuclein: a link between the gut and brain in Parkinson's Disease. Workshop "Out of the box research on neurodegeneration", SNS, Pisa 2018.
- Pathobiology of alpha-synuclein in Parkinson's Disease and alpha-synucleinopathies. Axial Biotherapeutics, Boston, MA, USA 2018.
- Modelling alpha-synucleinopathies in vivo and in vitro. Brain storming @7T IRCSS Stella Maris Foundation, Pisa, Italy 2017.
- In search for endoplasmic reticulum/microsomes-associated alpha-synuclein aggregates toxicity in Parkinson's Disease. Seminars of Neurobiology, IN CNR, Pisa 2013.
- Cross-talk between alpha-synuclein oligomers and the endoplasmic reticulum in Parkinson's Disease. Laboratory of Biology SNS Retreat 2012.
- Role of alpha-synuclein oligomers and ER stress in generation of alpha-synucleinopathy in vivo. Seminars of Neurobiology, IN CNR, Pisa 2011.
- Endoplasmic reticulum stress and microsomes aggregated  $\alpha$ -synuclein are associated with  $\alpha$ -synucleinopathies. EMD Serono, Cambridge MA, USA 2009.
- Endoplasmic reticulum stress and microsomes aggregated  $\alpha$ -synuclein are associated with  $\alpha$ -synucleinopathies in vivo. IIT, Genova Italy 2009.
- AD/PD meeting Prague, Czech Republic 2009. Endoplasmic reticulum stress and microsomes aggregated  $\alpha$ -synuclein are associated with  $\alpha$ -synucleinopathies in vivo.
- Endoplasmic reticulum stress response in a mouse model of  $\alpha$ -synucleinopathies in vivo. EPFL, Geneva, Switzerland, 2008.
- Endoplasmic reticulum stress response in a mouse model of  $\alpha$ -synucleinopathies in vivo. University of Aarhus, Denmark, 2008.

- Endoplasmic reticulum stress and  $\alpha$ -synucleinopathies: an update. Parkinson's Disease Research Council Meeting, Johns Hopkins School of Medicine, Baltimore MD USA, 2007.
- Endoplasmic reticulum stress and  $\alpha$ -synucleinopathies. Parkinson's Disease Research Council Meeting, Johns Hopkins School of Medicine, Baltimore MD USA, 2006.
- Role of RNA Helicase A in the regulation of TonEBP. Renal Joint Meeting NIH 2004.
- American Society of Nephrology, San Diego, CA, 2003. RNA Helicase A modulates transcriptional activity of TonEBP/NFAT5 in hypertonicity.

### **Funding**

- MJFF and Axial Biotherapeutics (Boston MA USA) grant 2021-2024. Project title: Target validation studies for the discovery of novel small molecule therapeutics with the potential to modify disease outcome by inhibiting bacterial amyloid protein-induced alpha-synuclein aggregation and associated neuronal toxicity.
- AlfaSigma (IT) grant 2021-2022. Project title: Technical attachment for Velusetrag in Parkinson's disease with excessive constipation.
- Internal Research and Development grant 2019 from JHU/APL, Laurel MD USA. Project title: A gut-based strategy to target constipation and brain neuronal loss in Parkinson's Disease.
- Joint Research Project of Cooperation in the field of Science and Technology between Italy and Serbia 2016-2018. Project title: Alpha-synuclein intracellular trafficking in vivo and in vitro: cross-talk between endoplasmic reticulum and mitochondria.
- SNS Internal funding 2015-2017. Project title: Developing a live cell imaging biosensor to monitor alpha-synuclein aggregation in living cells.
- SNS Internal funding 2012-2014. Project title: Functional characterization of ER-associated alpha-synuclein oligomers and aggregates.
- Career Reintegration Grant from the Italian Ministry of Education (MIUR) for 2011-2017 Project title: Molecular mechanisms of neurodegeneration in alpha-synucleinopathy.

### **Awards**

- New Instructor Award, Engineering for Professionals Faculty meeting, Johns Hopkins University, Baltimore MD USA 2021.
- Winner of Junior Faculty Award and presentation at 9th International Conference ADPD, Prague 2009.

### **Activity of Editor/Grants and Scientific journal reviewer**

- Guest Editor for LIFE Special Issue (MDPI) titled: Alpha-Synuclein and Non-Motor Symptoms of Parkinson's Disease. [https://www.mdpi.com/journal/life/special\\_issues/Alpha\\_PD](https://www.mdpi.com/journal/life/special_issues/Alpha_PD) June 25, 2021.
- Scientific reviewer for Journal of Neurochemistry, Neural Regeneration Research, Translational Neurodegeneration, Neuropathology and Applied Neurobiology, Life, Biology, Neurogastroenterology and Motility, Cells, Int J of Mol Science.
- Grant reviewer for UK Parkinson's Disease Association.

### **Publications on peer-reviewed scientific journals**

1. Grigoletto J, Colla E. Alpha-Synuclein and Parkinson's Disease Motor and Non-Motor Symptoms: What Is New? *Life* (Basel). 2022 Jun 16;12(6):904. doi: 10.3390/life12060904.

2. Pellegrini C, D'Antongiovanni V, Miraglia F, Rota L, Benvenuti L, Di Salvo C, Testa G, Capsoni S, Carta G, Antonioli L, Cattaneo A, Blandizzi C, **Colla E\***, Fornai M\*. Enteric  $\alpha$ -synuclein impairs intestinal epithelial barrier through caspase-1-inflammasome signaling in Parkinson's disease before brain pathology. *NPJ Parkinsons Dis.* Jan 12;8(1):9, 2022. doi: 10.1038/s41531-021-00263-x.  
\*Colla E and M Fornai shared senior authorship for this publication.
3. Miraglia F, Valvano V, Rota L, Di Primio C, Quercioli V, Betti L, Giannaccini G, Cattaneo A, **Colla E.** Alpha-synuclein FRET biosensors reveal early alpha-synuclein aggregation in the endoplasmic reticulum. *Life* 10(8), 147, 2020. DOI:10.3390/life10080147
4. **Colla E.** Linking the Endoplasmic Reticulum to Parkinson's Disease and alpha-synucleinopathy. Invited review for *Frontiers in Neuroscience Reserach* topic: Mitochondria and Endoplasmic Reticulum Dysfunction in Parkinson's Disease. 2019 May 29;13:560. doi: 10.3389/fnins.2019.0056.
5. Miraglia F., **Colla E.** Microbiome, Parkinson's disease and molecular mimicry. Invited review for Special Issue: The molecular and cellular basis of Parkinson's Disease. *Cells* 2019, 8, 222; doi:10.3390/cells8030222
6. Constipation, deficit in colon contractions and alpha-synuclein inclusions within the colon precede motor abnormalities and neurodegeneration in the central nervous system in a mouse model of alpha-synucleinopathy. L. Rota, C. Pellegrini, L. Benvenuti, L. Antonioli, M. Fornai, C. Blandizzi, A. Cattaneo, **E. Colla.** *Translational Neurodegeneration* 8:5, 2019. DOI: 10.1186/s40035-019-0146-z.
7. Miraglia F, Rota L, Ricci A, **Colla E.** Subcellular localization of alpha-synuclein aggregates and their interaction with membranes. Invited review. *Neural Regene Res* 13(7):1136-1144, 2018. DOI:10.4103/1673-5374.235013.
8. Panattoni G, Rota L, **Colla E.** Exogenous administration of microsomes-associated alpha-synuclein aggregates to primary neurons as a powerful cell model of fibrils formation. Invited paper. *J. Vis. Exp* 136: e57884, 2018. DOI:10.3791/57884.
9. **Colla E\***, Panattoni G, Ricci A, Rizzi C, Rota L, Carucci N, Valvano V, Gobbo F, Capsoni S, Lee MK, Cattaneo A. Toxic properties of microsome-associated alpha-synuclein species in mouse primary neurons. *Neurobiol Dis.* Mar; 111:36-47, 2018. DOI: 10.1016/j.nbd.2017.12.004. \*Colla E is first and corresponding author for this publication.
10. **Colla E**, Coune P, Liu Y, Pletnikova O, Troncoso JC, Iwatsubo T, Schneider BL, Lee MK. Endoplasmic reticulum stress is important for the manifestations of alpha-synucleinopathy *in vivo*. *J Neurosci* Mar 7; 32: 3306-3320, 2012. ISSN: 0270-6474, DOI: 10.1523/JNEUROSCI.5367-11.2012
11. **Colla E**, Jensen PH, Pletnikova O, Troncoso JC, Glabe CG, Lee MK. Accumulation of toxic alpha-synuclein oligomer within endoplasmic reticulum occurs in alpha-synucleinopathy *in vivo*. *J Neurosci*, Mar 7;32:3301-3305, 2012. ISSN: 0270-6474, doi: 10.1523/JNEUROSCI.5368-11.2012
12. Yang Q, She H, Gearing M, **Colla E**, Lee MK, Shacka JJ, Mao Z. Regulation of neuronal survival factor MEF2D by chaperone-mediated autophagy. *Science* Jan 2; 323(5910): 124-7, 2009. ISSN: 0036-8075 DOI: 10.1126/science.1166088
13. Miller R, Kiser GL, Kaysser-Kranich T, Casaceli C, **Colla E**, Lee MK, Palaniappan C, and HJ Federoff. Wild-type and mutant alpha-synuclein induce a multi-component gene expression profile consistent with shared pathophysiology in different transgenic mouse models of Parkinson's disease. *Exp Neurol* Mar 204(1): 421-32, 2007. ISSN: 0014-4886 DOI: 10.1016/j.expneurol.2006.12.005
14. Li WX, West N, **Colla E**, Pletnikova O, March L, Dawson TM, Jakala P, Hartmann T, Price DL, and Lee MK. Aggregation promoting C-terminal truncation of alpha-synuclein is a normal cellular process and is enhanced by the familial Parkinson's disease-like mutations. *PNAS* Feb 8 102 (6): 2162-2167, 2005. ISSN: 0027-8424, DOI: 10.1073/pnas.0406976102
15. Kwon MS, Lee SD, Kim JA, **Colla E**, Choi YJ, Suh PG, Kwon HM. Novel nuclear localization signal regulated by ambient tonicity in vertebrates. *J Biol Chem* Aug 15; 283(33):22400-9 2008, 2008. ISSN: 0021-9258, doi: 10.1074/jbc.M710550200

16. **Colla E**, Lee SD, Sheen MR, Woo KW, and HM Kwon. TonEBP is inhibited by RNA helicase A via interaction involving the E'F loop. *Biochem. J.* Jan 1; 393:411–419, 2006. ISSN: 0264-6021, doi: 10.1042/BJ20051082
17. Lee SD, **Colla E**, Sheen MR, Na KY, Kwon HM. Multiple domains of TonEBP cooperate to stimulate transcription in response to hypertonicity. *J Biol Chem* Nov 28; 278 (48):47571-47577, 2003. ISSN: 0021-9258, doi: 10.1074/jbc.M308795200
18. Sala R, Rotoli BM, **Colla E**, Visigalli R, Parolari A, Bussolati O, Gazzola C.C. and Dall'Asta V. Two-way arginine transport in human endothelial cells: TNF- $\alpha$  stimulation is restricted to system y +. *Am J Physiol* Jan 282(1): C134-43, 2002. ISSN: 0363-6143

### **Publications on peer-reviewed conference proceedings**

1. Pellegrini, C; Antonioli, L; Colucci, R; Benvenuti, L; D'Antongiiovanni, V; Rota, L; Miraglia, F; Testa, G; Capsoni, S; Cattaneo, A; **Colla, E**; Blandizzi, C; Fornai, M. Enteric alpha-synuclein accumulation impairs intestinal epithelial barrier through inflammasome activation before the onset of brain pathology in a transgenic mouse model of Parkinson's disease. *Digestive week, Chicago, IL USA. Neurogastroenterology and motility* 32 (1):64, 2020. DOI:10.1111/nmo.13817
2. Enteric alpha-synuclein inclusions, colonic inflammation, increased mucosal permeability and alterations of bowel neuromuscular functions precede central neurodegeneration in a transgenic mouse model of Parkinson's disease. C. Pellegrini, L. Antonioli, R. Colucci, L. Benvenuti, V. D'Antongiiovanni, L. Rota, F. Miraglia, G. Testa, S. Capsoni, A. Cattaneo, **E. Colla**, C. Blandizzi, M. Fornai. *Gastroenterology* 156(6):S-229. DOI: 10.1016/S0016-5085(19)37369-X
3. **E Colla**, B Schneider, P Coune, PH Jensen, JC Troncoso, MK Lee. Toxic alpha-synuclein oligomer accumulation and endoplasmic reticulum stress is mechanistically linked to alpha-synucleinopathy in vivo. *MOLECULAR CELL BIOLOGY*. Vol. 23. USA: AMER SOC CELL BIOLOGY, Abstract n. 66, 2012. DOI: 10.1091/mbc.E12-10-0757
4. Lee MK, **E Colla**, C Glabe, PH Jensen Endoplasmic reticulum stress is associated with alpha-synucleinopathy in transgenic mice model. 23rd Biennial Meeting of ISN/ESN, Athens, Greece. *Journal of Neurochemistry* vol 118 issue S1, Pag 20 S09-01, 2011. DOI: 10.1111/j.1471-4159.2011.07324.x
5. Lee MK, Thomas B, Kim J, **Colla E**, Dawson T, Martin L. Synuclein dependent neurodegeneration and neuroprotection in vivo: implications for pathogenesis of Parkinson's Disease. 22nd Biennial Meeting of the International-Society-of-Neurochemistry/Asian-Pacific-Society-for-Neurochemistry. *Journal of Neurochemistry* vol. 110, p. 136, S15-03, Busan, South Korea, Aug 23-29, 2009. DOI: 10.1111/j.1471-4159.2009.06237.x ISSN: 0022-3042.
6. Lee SD, Sheen MR, Chen B, **Colla E**, Woo SK, Park WK, Chen D, Kwon HM. DNA-dependent protein kinase (DNA-PK) and Ataxia-Telangiectasia Mutated (ATM) protect cells from hypertonic stress by activating TonEBP transcriptional activator. *MOLECULAR BIOLOGY OF THE CELL* Vol. 14. USA: AMER SOC CELL BIOLOGY, Abstract n. 835, 2003.
7. Lee SD, **Colla E**, Park WK, Chen DJ, Kwon HM. DNA-dependent protein kinase (DNA-PK) phosphorylates and activates TonEBP/NFAT5 in response to hypertonicity. *Experimental Biology Annual Meeting San Diego, CA, USA. FASEB Journal*, vol. 17, p. A482, 2003. ISSN: 0892-6638. DOI: 10.1096/fasebj.17.3.532
8. **Colla E**, Lee SD, Sheen MR, Woo SK, Kwon HM. RNA helicase a modulates activity of TonEBP/NFAT5 transcriptional activator in hypertonicity. 36th Annual Meeting of the American-Society-of-Nephrology. *Journal of the American Society of Nephrology*, vol. 14, p. 56A, SU-FC256, San Diego, CA, USA. Nov 12-17, 2003. ISSN: 1046-6673.
9. Lee SD, **Colla E**, Woo SK, Park WK, Nahm O, Kwon HM. Nuclear localization signal of TonEBP is regulated by changes in tonicity. *Experimental Biology Annual Meeting, New Orleans, MI, USA. FASEB Journal* vol. 16, p. A56, 2002. ISSN: 0892-6638. DOI: 10.1096/fasebj.16.3.444

10. Sala R, Rotoli BM, Visigalli R, **Colla E**, Bussolati O, Parolari A, Dall'Asta V. LPS and TNF alpha increase arginine transport but not nitric oxide production in cultured human endothelial cells. Experimental Biology Annual Meeting Orlando, FL, USA. FASEB Journal, vol. 15, p. A452, 2001. ISSN: 0892-6638. DOI: 10.1096/fasebj.15.3.855
11. Sala R, Dall'Asta V, Bussolati O, **Colla E**, Rotoli BM, Parolari A, Gazzola GC. LPS and TNF alpha increase arginine transport and CAT-2 expression in cultured human endothelial cells. Experimental Biology Annual Meeting San Diego, CA, USA. FASEB Journal, vol. 14, p. A693, 2000. ISSN: 0892-6638. DOI: 10.1096/fasebj.14.3.612

### **Abstracts for international meetings (poster presentation)**

1. Grigoletto J\*, Miraglia F\*, Sorteni C, Conrad M, Crocco E, Senter R, Cremisi F, Cattaneo A, Campbell S, **Colla E**. Colonic organotypic cultures isolated from a prodromal PD mouse model show abnormal electrical activity linked to a sustained Ca<sup>2+</sup> signaling. AD/PD meeting Goteborg, Sweden 2023.
2. F. Miraglia, V. Valvano, L. Rota, G. Siano, C. Di Primio, V. Quercioli, L. Betti, G. Giannaccini, A. Cattaneo, **E. Colla**. FRET alpha-synuclein biosensors (FABs): a fluorescent window to shed light on alpha-synuclein aggregation. ADPD Meeting, Lisbon 2019.
3. L. Rota, C. Pellegrini, L. Benvenuti, L. Antonioli, M. Fornai, C. Blandizzi, A. Cattaneo, **E. Colla**. Gastrointestinal dysfunction and  $\alpha$ -synuclein inclusions in enteric neurons precede neurodegeneration in the central nervous system in a mouse model of  $\alpha$ -synucleinopathies. AAT-ADPD Meeting, Turin, Italy 2018.
4. L. Rota, C. Rizzi, S. Capsoni, G. Testa, A. Cattaneo, **E. Colla**. Gastrointestinal dysfunction and  $\alpha$ -synuclein inclusions in enteric neurons precede neurodegeneration in the central nervous system in a mouse model of  $\alpha$ -synucleinopathies. Neuroscience Meeting 2017, Washington DC USA.
5. Rota L, Rizzi C, Capsoni S, Testa G, Cattaneo A, **Colla E**. Gastrointestinal dysfunction as a predictive marker for the development of Parkinson's Disease in a mouse model of  $\alpha$ -synucleinopathies. ADPD Meeting, Vienna, Austria 2017.
6. **Colla E**, Rota L, Liverani V, Cattaneo A. Modelling  $\alpha$ -synuclein aggregation in a cell system. CNR Retreat, Pisa, 2015.
7. **Colla E**, Liverani V, Cattaneo A. Modelling  $\alpha$ -synuclein aggregation in a cell system. Neuroscience Meeting 2014, Washington DC USA.
8. **Colla E**, Liu Y, Stirling W, Jensen PH, Iwatsubo T, and MK Lee. Endoplasmic Reticulum Stress and microsomes aggregated  $\alpha$ -synuclein are associated with the  $\alpha$ -synucleinopathies in vivo. Neuroscience 2009, Chicago IL USA.
9. **Colla E**, Liu Y, Stirling W, Finley A, and MK Lee. Endoplasmic reticulum stress is associated with  $\alpha$ -synucleinopathy in human  $\alpha$ -synuclein transgenic mouse model. Neuroscience Meeting 2008, Washington DC USA.
10. **Colla E**, Stirling W, Van Wert P, and MK Lee. Endoplasmic reticulum stress is associated with  $\alpha$ -synucleinopathy in human  $\alpha$ -synuclein transgenic mouse model. Neuroscience Meeting 2007, San Diego CA USA.
11. **Colla E**, Stirling W, Van Wert P, and MK Lee. Endoplasmic reticulum stress is associated with  $\alpha$ -synucleinopathy in human  $\alpha$ -synuclein transgenic mouse model. Neuroscience Meeting 2006, Atlanta GE USA.
12. Sala R, Rotoli BM, **Colla E**, Dall'Asta V, Bussolati O, Gazzola GC. "Characterization and regulation of cationic amino acid transport by LPS and TNF in human umbilical vein endothelial cells". FASEB Summer Research Conference, Tucson, AZ 2001.
13. Sala R, Rotoli BM, **Colla E**, Dall'Asta V, Parolari A, Bussolati O, e Gazzola GC. "Characterization and regulation of cationic amino acid transport in human endothelial cells" International Meeting Transporters, Barcellona, Spain 2000.
14. Sala R, Parolari A, **Colla E**, Bussolati O, and Gazzola GC. "Isolation and culture of saphenous vein endothelial cells: study of fibrinolytic activity", 2nd Italian Congress of Biotechnology, Parma, Italy 1998.

### **Submitted article**

Grigoletto J, Miraglia F, Benvenuti L, Pellegrini C, Soldi S, Galletti S, Cattaneo A, Merlo Pich E, Grimaldi M, Colla E\* and Vesci L\*.\_The 5-HT4 receptor agonist, Velusetrag, rescues GI dysfunction, gut inflammation and dysbiosis in the A53T aS mouse model of Parkinson's Disease. Under consideration for NPJ Parkinson's Disease.

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