

PERSONAL STATEMENT

Dr. Marzia Bedoni (MB) is senior scientist and Head of Laboratory of Nanomedicine and Clinical Biophotonics (LABION: www.labion.eu) in FDG. MB graduated in Biological Sciences at the University of Milan where she obtained also her PhD in Morphological Sciences (2007). She carried out her Post-Doc in FDG granted by the Cariplo Foundation, Seed Capital and FP7 call and became permanent researcher in 2011. Her group works on multiple projects in particular: i) **nano-biophotonics for the characterisation of exosomes as regenerative rehabilitation markers**; ii) **biophotonics application for diagnosis and therapy monitoring in neurodegenerative diseases** (Alzheimer's disease and Amyotrophic Lateral Sclerosis), skin diseases (psoriasis, cancer), leukemia and; iii) nanoparticles toxicity on human skin biology; iv) biocompatibility in transdermal drug delivery and dry electrodes devices.

She is member of the Leadership Council of the International Consortium for Regenerative Rehabilitation (founded by University of Pittsburgh, Stanford University and Mayo Clinic), Chair of the Clinical Interface Group in the European Technology Platform of Nanomedicine and Founding Member of Italian Society for Extracellular Vesicle. MB is also member and past board-member (2012-2017) of Society for Cutaneous Ultrastructure Research, member of European Society for Dermatological Research and Società Italiana di Anatomia e Istologia.

She is supervisor of PhD candidates of the Doctorate in Molecular and Translational Medicine of the University of Milano-Bicocca and Lecturer in Human Anatomy and Epidemiology for the Faculty of Medicine and Surgery at the University of Milan since 2010.

MB is author of several peer-reviewed scientific papers and she is co-inventor of 4 patents. She received several awards during international congresses for her studies and she is involved in several granted projects as PI or partner.

POSITIONS AND HONORS

Training and Professional Appointments

2004-2007	PhD student in Morphological Science, Department of Human Morphology, University of Milan.
2007-2010	Post-Doctoral Research Scientist, Fondazione Don Carlo Gnocchi, Biomedical Technology Department Milan, Italy. Research activity in the field of biocompatibility in transdermal drug delivery device and dry electrodes.
2008- 2015	Visiting Research Scientist, Department of Human Morphology, Faculty of Medicine and Surgery (University of Milan). Research field of terminal differentiation, proliferation, and apoptosis in normal and pathological human stratified squamous epithelia (skin and oral mucosa) by means of Light Microscopy and Transmission Electron Microscopy. Cell differentiation in human colon carcinoma cell lines HT29 and Caco2.
2011- 2017	Permanent Researcher Fondazione Don Carlo Gnocchi, Biomedical Technology Department Milan, Italy. Nanomedicine and Biophotonics application for early diagnosis and therapy monitoring in neurodegenerative pathologies.
2018- today	Head of Laboratory of Nanomedicine and Clinical Biophotonics (LABION) at Fondazione Don Carlo Gnocchi, Milan, Italy.

Honors, awards and fellowships

2004-2007	Full scholarship for a PhD position in Morphological Science at the University of Milan (Italy).
2006	“Best Poster Presentation Award”: 33rd Annual Meeting of the Society for Cutaneous Ultrastructure Research (SCUR)”, Warszawa, Poland 8th-10th June.
2007	“SCUR 2007 Travel Grant”: 34° Annual Meeting of Society for Cutaneous Ultrastructure Research (SCUR). Prague, Czech Republic 14th –16th June.
2009	“SCUR 2009 Prof. D. Innocenzi Memorial Grant” 36° Annual Meeting of Society for Cutaneous Ultrastructure Research (SCUR). Firenze, 11th-13th June.
2011	“ESDR 2011 Travel Grant”. 41st Annual ESDR Meeting. Barcelona, 7th-10 September.
2012-2017	Board Member Society for Cutaneous Ultrastructure Research (SCUR)
2018-today	Leadership Council Member of International Consortium for Regenerative Rehabilitation from University of Pittsburgh
2019-today	Chair Clinical Translation and Social Impact Group - European Technology Platform of Nanomedicine

RESEARCH SUPPORT

Meeting Organization

- 2006** III Symposium of Cellular Biology of Epithelia. Department of Human Morphology, University of Milan, 6th November. Event ECM 4512-260622.
- 2008** Eziologia, Diagnosi e Terapia della Burning Mouth Syndrome. Department of Human Morphology, University of Milan, 6th October. Event ECM 4512-8038311.
- 2009** EuroNanoBio Roadmapping Workshop, Fondazione Don Carlo Gnocchi ONLUS-IRCCS S. Maria Nascente, Milan, 12nd-13rd October.
- 2010** European Technology Platform General Assembly, Fondazione Don Carlo Gnocchi ONLUS-IRCCS S. Maria Nascente, Milan, 14-15 October.
- 2012** NanoBio Europe, JRC, Varese, 18-20 June
- 2017** - 44° Annual Meeting of SCUR. UNIMI Milan 8-10 June.
- LABION Workshop - The promise of circulating miRNAs as disease biomarkers:clinical, analytical and technological challenges. 19 December, Fondazione Don Carlo Gnocchi IRCCS Milano
- 2018** - Meet Me Tonight, la Notte dei Ricercatori
- 2020**
- 2019** - Nanoinnovation 2019/2020, Roma, NANOMEDICINE: applications from bench to bedside
- 2020**

Funded Grants

- 1) Italian Ministry of Health, Conto Capitale (2020-2022). "Reabilomica: studio delle vescicole extracellulari come biomarcatori per il monitoraggio del trattamento riabilitativo e della rigenerazione tissutale in pazienti colpiti da ictus". (PI: M. Bedoni) 230.000 €
- 2) Fondazione Regionale per la Ricerca Biomedica (FRRB), Call for collaborative projects II (2020-2023), "New frontiers of engineered nanovectors to improve treatment efficacy and safety in neurological disorders". (PI: M. Bedoni) 3.500.000 €
- 3) Italian Ministry of Health, Ricerca Finalizzata (2019-2022). "Towards a powerful tool for the stratification of amyotrophic lateral sclerosis patients: salivary biomarkers detection by the combination of Raman spectroscopy and MALDI-TOF spectrometry" (PI: Cristiano Carlomagno) 130.000€
- 4) 2020-ICT-CSA (2017-2020), "In-depht support for innovation and exploitation in Smart System Integration". (PI Unit: Dr. Furio Gramatica). 1.499.000 € (48.250 to Labion FDG)
- 5) Italian Ministry of Health (PI: M. Bedoni):
 - Analisi Raman di fluidi biologici come tool analitico per la diagnosi del morbo di Alzheimer
 - Caratterizzazione di esosomi circolanti come nuovi marcatori prognostici nei pazienti colpiti da ictus
 - Ruolo degli esosomi nella patogenesi e nella diagnosi della malattia di Alzheimer
- 6) EuroNanoMed II, 5th Joint Call (2014-2017) "NanoPlasmiRNA,". (PI: Dr. R. Vanna). 490.000 € (250.000 € to Labion FDG)
- 7) H2020-NMP-CSA-(2014-2015), CSA, "Enabling NANomedicine TRANslation"(PI: Dr. Furio Gramatica). 1.070.525,00 € (90.000 € to Labion FDG)
- 8) EuroNanoMed II, 4th Joint Call (2013) "InNaSERSS,". (PI: Dr. C. Morasso). 440.000 € (200.000 € to Labion FDG)
- 9) FP7-Health-2012 (2013)-Innovation-1-Coordination and Support Action. " NANOMED2020— Enabling the European Nanomedicine Area until 2020" (PI: Dr. Furio Gramatica). 620.000 € (45.000 € to Labion FDG)
- 10) Ministero della Salute, Conto Capitale, (2012). (PI: Dr. F. Gramatica). 800.000 € (300.000 € to Labion FDG)
- 11) Fondazione Cariplo: (2012) "MULAN". (PI: Dr. F. Gramatica). 485.000 € (50.000 € to Labion FDG)
- 12) Fondazione Cariplo : (2012)"Bando Giovani ricercatori". (PI: Dr. D. Mehn). To Labion FDG 340.000 € (total amount)
- 13) Ministero della Salute, Conto Capitale, (2010). (PI: Dr. F. Gramatica) To Labion FDG 600.000€ (total amount)
- 14) FP7-NMP-2009- Collaborative Support Action (2009-2010). Project title: "Euronanobio- European scale infrastructure in Nanobiotechnology" (PI: Dr. Furio Gramatica). To Labion FDG 123.000 €
- 15) TTSeed Capital: (2009-2010), "Nano for Health, turning nano-innovation into healthcare" (PI: Dr. Furio Gramatica) Labion FDG 250.000 € (total amount)
- 16) Cariplo Foundation: (2007-2009) "Sviluppo di un dispositivo microstrutturato per la somministrazione transdermale continuativa e modulabile di farmaci" (PI: Dr. Furio Gramatica). To Labion FDG 250.000 € (total amount)

SCIENTIFIC PUBLICATIONS

2005

- 1) Donetti E, Bedoni M, Boschini E, Bertelli AAE, Sforza C, Gagliano N. "Early epidermal response after a single dose of γ -rays in organotypic culture of human breast skin". *Br J Dermatol.* 2005;153:881-6. Ifg 2.98
- 2) Donetti E, Bedoni M, Boschini E, Dellavia C, Barajon I, Gagliano N. "Desmocollin 1 and desmoglein 1 expression in human epidermis and keratinizing oral mucosa: a comparative immunohistochemical and molecular study". *Arch Dermatol Res.* 2005;297:31-8. Ifg 1.22
- 3) Gagliano N, Torri C, Donetti E, Grizzi F, Costa F, Bertelli AA, Migliori M, Filippi C, Bedoni M, Panichi V, Giovannini L, Gioia M. "Ochratoxin A-induced renal cortex fibrosis and epithelial-to-mesenchymal transition: molecular mechanisms of ochratoxin A-injury and potential effects of red wine". *Mol Med.* 2005;11:30-8. Ifg 3.35

2007

- 4) Bedoni M, Sforza C, Dolci C, Donetti E. "Proliferation and differentiation biomarkers in normal human breast skin organotypic cultures". *J Dermatol Sci.* 2007;46:139-42. Ifg 2.50
- 5) Gravaghi C, Del Favero E, Cantù L, Donetti E, Bedoni M, Fiorilli A, Tettamanti G, Ferraretto A. "Casein phosphopeptide promotion of calcium uptake in HT-29 cells-relationship between biological activity and supramolecular structure". *FEBS Journal.* 2007;274:4999-5011. Ifg 3.40
- 6) Ferraretto A, Gravaghi C, Donetti E, Cosentino S, Donida BM, Bedoni M, Lombardi G, Fiorilli A, Tettamanti G. "New methodological approach to induce a differentiation phenotype in Caco-2 cells prior to post-confluence stage". *Anticancer Res.* 2007;27:3919-26. Ifg 1.41
- 7) Gagliano N, Bedoni M, Mantovani G, Chiriva-Internati M, Castelli D, Torri C, Donetti E. "Effect of a topical treatment in organotypic culture of human breast skin after exposure to gamma-rays". *Eur J Histochem.* 2007;51:283-89. Ifg 1.26

2008

- 8) Palazzo M, Gariboldi S, Zanobbio L, Dusio GF, Selleri S, Bedoni M, Balsari A, Rumio C. "Cross-talk among Toll-like receptors and their ligands". *International Immunol.* 2008;20:709-18. Ifg 3.18

- 9) Matteucci M, Casella M, Bedoni M, Donetti E, Fanetti M, De Angelis F, Gramatica F, Di Fabrizio E. "A compact and disposable transdermal drug delivery system". *Microelectr Eng.* 2008;82:1066-73. Ifg 1.58
- 10) Donetti E, Bedoni M, Guzzi G, Pigatto P, Sforza C. "Burning mouth syndrome possibly linked with an amalgam tattoo: clinical and ultrastructural evidence". *Eur J Dermatol.* 2008;18:723-4. Ifg 1.97

2009

- 11) Corsini E, Racchi M, Lucchi L, Donetti E, Bedoni M, Viviani B, Galli CL, Marinovich M. "Skin immunosenescence: decreased receptor for activated C kinase-1 expression correlates with defective tumor necrosis factor-alpha production in epidermal cells". *Br J Dermatol.* 2009;160:16-25. Ifg 3.49
- 12) Donetti E, Bedoni M, Capone P, Gualerzi A, Tartaglia G, Sforza C. "An in vitro model of human oral explants to study early effects of radiation mucositis." *Eur J Oral Sci.;* 2009;117:169-174. Ifg 1.96

2010

- 13) Cosentino S, Gravaghi C, Donetti E, Donida BM, Lombardi G, Bedoni M, Fiorilli A, Tettamanti G, Ferraretto A. "Casein phosphopeptide-induced calcium uptake in human intestinal cells lines HT-29 and CACO2 is correlated to cellular differentiation". *J Nutr Biochem.* 2010; 21:247-254. Ifg 4.54
- 14) Donetti E, Gualerzi A, Bedoni M, Volpari T, Sciarabba M, Tartaglia G, Sforza C. "Desmoglein 3 and keratin 10 expressions are reduced by chronic exposure to cigarette smoke in human keratinized oral mucosa explants". *Arch Oral Biol.* 2010;55:815-823. Ifg 1.46

2011

- 15) Casella M; Lucotti A; Tommasini M; Bedoni M; Forvi E; Gramatica F; Zerbi G. "Raman and SERS recognition of Beta-Carotene and Haemoglobin fingerprints in Human Whole Blood". *Spectrochimica Acta Part A.* 2011;79:915-19. Ifg 2.1

2012

- 16) Forvi E; Bedoni M; Carabalona R; Soncini M; Mazzoleni P; Rizzo F; O'Mahony C; Morasso C; Cassarà DG; Gramatica F. "Preliminary technological assessment of microneedles-based dry electrodes for biopotential monitoring in clinical examinations. *Sens. Actuators A: Phys.* 2012;180:177-186. Ifg. 1,84
- 17) Donetti E, Gualerzi A, Ricceri F, Pescitelli L, Bedoni M, Prignano F. "Etanercept restores a differentiated keratinocyte phenotype in psoriasis human skin: a morphological study". *Exp Dermatol:* 2012;21:549-551. Ifg. 3.58

2013

- 18) Mehn D, Morasso C, Vanna R, Bedoni M, Prosperi D, Gramatica F. "Immobilized gold nanostars in a paper based test system for Surface Enhanced Raman Spectroscopy". *Vib Spectrosc* 2013;68:45–50. Ifg. 1.75

2014

- 19) Morasso C, Mehn D, Vanna R, Bedoni M, Forvi E, Colombo M, Prosperi D, Gramatica F. "One-Step Synthesis of Star-Like Gold Nanoparticles for Surface Enhanced Raman Spectroscopy". *Mater. Chem. Phys.* 2014;143:1215–21.2013. Ifg. 2.26
- 20) Mehn D., Morasso C., Vanna R., Schiumarini D., Bedoni M., Ciceri F., Gramatica F. "Surface Enhanced Raman Spectroscopy based method for leukemia biomarker detection using magnetic core @ gold shell nanoparticles" *BioNanoScience*. 2014;4(2):119-127.
- 21) Picciolini S; Mehn D; Morasso C; Vanna R; Bedoni M; Pellacani P; Marchesini G; Valsesia A; Prosperi D; Tresoldi C; et al.
"Polymer nanopillar-gold arrays as surface-enhanced Raman spectroscopy substrate for the simultaneous detection of multiple genes" *ACS Nano*. 2014;8(10):10496-10506 Ifg.12,88

2015

- 22) S. Picciolini, N. Castagnetti, R. Vanna, D. Mehn, M. Bedoni, F. Gramatica, M. Villani, D. Calestani, M. Pavesi, L. Lazzarini, A. Zappettini and C. Morasso. "Branched gold nanoparticles on ZnO 3D architecture as biomedical SERS sensors". *RSC Advances*. 2015;5(113):93644-93651 Ifg:3,84
- 23) R. Vanna; P. Ronchi; A.T.M. Lenferink; C. Tresoldi; C. Morasso; D. Mehn; M. Bedoni; S. Picciolini; L.W.M.M. Terstappen; F. Ciceri; et al.
"Label-free imaging and identification of typical cells of acute myeloid leukaemia and myelodysplastic syndrome by Raman microspectroscopy" *Analyst*. 2015;140(4):1054-1064. Ifg:4.10
- 24) Santini B; Zaroni I; Marzi R; Cigni C; Bedoni M; Gramatica F; Palugan L; Corsi F; Granucci F; Prosperi D; Colombo M. "Cream Formulation Impact on Topical Administration of Engineered Colloidal Nanoparticles". *PlosOne*. 2015;10(5). Ifg 3,23
- 25) Morasso C; Picciolini S; Schiumarini D; Mehn D; Ojea-Jiménez I; Zanchetta G; Vanna R; Bedoni M; Prosperi D; Gramatica F. "Control of size and aspect ratio in hydroquinone-based synthesis of gold nanorods". *Journal of Nanoparticle Research*. 2015;17(8). Ifg:2,18

2017

- 26) Gualerzi A, Niada S, Giannasi C, Picciolini S, Morasso C, Vanna R, Rossella V, Masserini M, Bedoni M, Ciceri F, Bernardo ME, Teresa Brini A, Gramatica F. Raman spectroscopy uncovers biochemical tissue-related features of extracellular vesicles from mesenchymal stromal cells. *Sci Rep* 2017;29(1):9820 Ifg 4.26

2018

- 27) Picciolini, S., Gualerzi, A., Vanna, R., Sguassero, A., Gramatica, F., Bedoni, M., Masserini, M; Morasso, CF. Detection and characterization of different brain-derived subpopulations of plasma exosomes by Surface Plasmon Resonance imaging. *Nalytical Chemistry*;90(15):8873-8880. Ifg 6.04

2019

- 28) Sguassero, A., Artiga, Á., Morasso, C., Jimenez, R. R., Rapún, R. M., Mancuso, R., Agostini, S., Hernis, A., Abols, A., Linē, A., Gualerzi, A., Picciolini, S., Bedoni, M., Rovaris, M., Gramatica, F., de la Fuente, J. M. & Vanna, R. A simple and universal enzyme-free approach for the detection of multiple microRNAs using a single nanostructured enhancer of surface plasmon resonance imaging. *Anal Bioanal Chem.* 2019. 411(9), pp. 1873-1885 Ifg 3.31
- 29) Gualerzi, A., Kooijmans, S. A. A., Niada, S., Picciolini, S., Brini, A. T., Camussi, G. & Bedoni, M. Raman spectroscopy as a quick tool to assess purity of extracellular vesicle preparations and predict their functionality., 2019, *Journal of Extracellular Vesicles*. 8, 1, 1568780. Ifg 11
- 30) Gualerzi, A., Picciolini, S., Carlomagno, C., Terenzi, F., Ramat, S., Sorbi, S., Bedoni, M. Raman profiling of circulating extracellular vesicles for the stratification of Parkinson's patients (2019) *Nanomedicine: Nanotechnology, Biology, and Medicine*, 22, art. no. 102097,

2020

- 31) Carlomagno C, Banfi PI, Gualerzi A, Picciolini S, Volpato E, Lax A, Colombo E, Ticozzi N, Verde F, Silvani V, Bedoni M. "Human salivary Raman fingerprint as biomarker for the diagnosis of Amyotrophic Lateral Sclerosis". *Scientific Reports*, 2020, 10(1),10175
- 32) Willett NJ, Boninger ML, et al. "Taking the Next Steps in Regenerative Rehabilitation: Establishment of a New Interdisciplinary Field" *Archives of Physical Medicine and Rehabilitation* Volume 101, Issue 5, 2020, Pages 917-923.
- 33) Gori A, Romanato A, Bergamaschi G, Strada A, Gagni P, Frigerio R, Brambilla D, Vago R, Galbiati S, Picciolini S, Bedoni M, Daaboul G, Chiari M, Cretich M. "Membrane-

binding peptides for extracellular vesicles on-chip analysis." *Journal of Extracellular Vesicles*, 2020, 9, 1751428; doi: 10.1080/20013078.2020.1751428

- 34) Carlomagno C, Cabinio M, Picciolini S, Gualerzi A, Baglio F, Bedoni M. "SERS-based biosensor for Alzheimer disease evaluation through the fast analysis of human serum". *J Biophotonics*. 2020 Volume 13, Issue 3, 1 March 2020, Article number e201960033
- 35) Cheuy V, Picciolini S, Bedoni M. " Progressing the field of regenerative rehabilitation through novel interdisciplinary interaction", *NPJ Regenerative Medicine* 2020. <https://doi.org/10.1038/s41536-020-00102-2>
- 36) Randelli F, Sartori P, Carlomagno C, Bedoni M, Menon A, Vezzoli E, Sommariva M and Gagliano N. "The Collagen-Based Medical Device MD-Tissue Acts as a Mechanical Scaffold Influencing Morpho-Functional Properties of Cultured Human Tenocytes". *Cells* 2020, 9, 2641; doi:10.3390/cells9122641

2021

- 37) Carlomagno C°, Giannasi C°, Niada S, Bedoni M, Gualerzi A*, Brini AT*. Raman fingerprint of extracellular vesicles and conditioned media for the reproducibility assessment of cell-free therapeutics. *Frontiers in Bioengineering and Biotechnology*, 2021; ID: 640617 (°, * equal contribution) doi: 10.3389/fbioe.2021.640617
- 38) Carlomagno C, Gualerzi A, Picciolini S, Rodà F, Banfi PI, Lax A, Bedoni M. Characterization of the COPD Salivary Fingerprint through Surface Enhanced Raman Spectroscopy. *Diagnostics*, 2021. ID: diagnostics-1140688. doi: 10.3390/diagnostics11030508
- 39) Carlomagno C, Bertazioli D, Gualerzi A, Picciolini S, Banfi PI, Lax A, Messina E, Navarro J, Bianchi L, Caronni A, Marengo F, Monteleone S, Arienti C, Bedoni M. COVID-19 salivary Raman fingerprint: innovative approach for the detection of current and past SARS-CoV-2 infections. *Scientific Reports*, 2021. doi: 10.1038/s41598-021-84565-3
- 40) Picciolini S, Gualerzi A, Carlomagno C, Cabinio M, Sorrentino S, Baglio F, Bedoni M. An SPRi-based biosensor pilot study: Analysis of multiple circulating extracellular vesicles and hippocampal volume in Alzheimer's disease. *JPBA* 2021; 192: 113649; doi.org/10.1016/j.jpba.2020.113649
- 41) *Biophotonics for diagnostic detection of extracellular vesicles*. Gualerzi, A., Picciolini, S., Carlomagno, C., Rodà, F., Bedoni, M. *Advanced Drug Delivery Reviews*, 2021, 174, pp. 229–249.

Scientific Collaborations

- University of Pittsburgh: Prof. Fabrisia Ambrosio, Prof. Michael Boninger,
- Università Milano Bicocca: Prof. Messina Vincenza, Prof. Massimo Masserini; Dr.ssa Francesca Re
- CNR:Dr. Claudia Verderio
- Università di Torino: Prof. Giovanni Camussi
- Spanish National Research Council: Dr. Jesus M. De la Fuente
- IRCCS Istituto Ortopedico Galeazzi: Dr. Anna Teresa Brini
- Ospedale San Raffaele: Prof. Roberto Furlan, Dr. Maria Ester Bernardo
- Ospedale Humanitas: Prof. Michela Matteoli
- University Medical Center Utrecht: Prof. Raymond Schiffelers
- University of Tweente: Dr. Cheese Otto
- Trinity College of Dublin: Prof. Adriele Prina Mello