

# ELENA ENZO, Curriculum vitae

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Born 17 of December 1984 in Venice (Italy)

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## BIBLIOMETRIC INDEX:

ORCID ID: <https://orcid.org/0000-0001-9768-6368>

NUMBER OF PUBLICATIONS: 27 peer-reviewed articles (5 articles as first author, 2 article as corresponding author);

H-INDEX: 16

TOTAL NUMBER OF CITATIONS: 7375 publications

## PROFESSIONAL EXPERIENCE

- 09/2022 – ongoing      Research Fellow as Associate Professor (Ricercatore a tempo determinato tipo B) in BIO/10 at the University of Modena and Reggio Emilia, ITALY
- 10/2018 – 08/2022      Research Fellow as Associate Professor (Ricercatore a tempo determinato tipo B) in BIO/10 at the University of Modena and Reggio Emilia, ITALY
- 05/2013 - 05/201      Post-doc fellowship at Centre for Regenerative Medicine, Università di Modena e Reggio Emilia, Via G.Gottardi 100, 41125 Modena, ITALY
- 01/2012 – 04/2013      Post-doc fellowship at Department of Histology, Università degli Studi di Padova, Viale G. Colombo 3, 35151 Padova, ITALY

## ISTITUTIONAL ACTIVITY

- 10/2022-ongoing:      Member of the teaching staff for the PhD school in Molecular and Regenerative Medicine – UNIMORE
- 2020-2024:              Member of the PhD supervisor committee at the University of Luxembourg (LSCB faculty) for Ms. Barvaux Sybille
- 05/2018-2024:        Member of the staff involved in analysis for phase I clinical trial in the UNIMORE certified laboratory (Lab1) as defined in Determina Generale from AIFA n° 158 10/07/2015)

## TEACHING

- AA 2020/2022: tematic lessons on “Studio del profilo trascrizionale delle cellule staminali epiteliali a livello di singola cellula” and “Sviluppo di ATMP per la cura dell'Epidermolisi Bollosa recessiva distrofica” for the Course of Regenerative Medicine (titolare Prof. Michele De Luca) for Master Degree in Medical Biotechnology (UNIMORE)
- AA 2021/2022: tematic lessons “Looking for an epithelial stem cells: the long and winding road for their clinical applications” for the course of “Stem cells in regenerative and molecular medicine” for the PhD school in Molecular and Regenerative Medicine
- AA 2018/ongoing– Course of Applied Biochemistry for Chimica e Tecnologie Farmaceutiche Degree, University of Modena and Reggio Emilia
- AA 2018/ongoing – Course of Biochemistry for the faculty of Medicine, University of Modena and Reggio Emilia
- AA 2013-2024 – Tutor for 4 master theses in Medical Biotechnology and 2 PhD thesis in Molecular and Regenerative Medicine.

## EDUCATION AND TRAINING

- 27 Ottobre 2023      “Wooclap inclusive”: remote course provided by Fabrizio Bracco, Dipartimento di Scienze della Formazione, Università di Genova
- 18-19/09/2023      “Corso di didattica per neo-.assunti”: in presence 16-hours teaching training course provided by University of Modena and Reggio Emilia
- 06/2018-06/2019 - TRAINING FOR GCLP QUALITY ASSURANCE IN PHASE I CLINICAL TRIAL: 1-year training under supervision of Dott.ssa Annamaria Lepore for construction and optimization of a GCLP-compliant quality system for analysis in phase I/II clinical trials regarding gene-therapy for Epidermolysis Bullosa patients
- 2009-2012              PhD in Biomedicine (3 years) Department of Histology, Università degli studi di Padova, Viale G. Colombo 3, 35151 Padova
- 2008                    Master's Degree (2 years) in Medical Biotechnology, Graduation mark: 110/110 (with honours) Università degli Studi di Padova.
- 2006                    Bachelor's Degree (3 years) in Sanitary Biotechnology, Graduation mark: 110/110 (with honors) Università degli Studi di Padova
- 1998-2003            Scientific High School Degree, Graduation mark: 100/100 Liceo Scientifico G.B. Benedetti, Venezia ITALY

## RESEARCH ACTIVITIES

My focus on single-cell sequencing approaches to deciphering self-renewal traits in epidermal stem cells (Polito et al, 2024, Cell death and disease; Enzo et al, 2021, Nature Communications). I'm involved in translational projects, as the life-saving gene therapy

for Junctional Epidermolysis Bullosa patient (Hirsch et al, 2017, Nature), the Hologene-5 clinical trial (De Rosa and Enzo, 2021, Frontiers in Genetics), and the establishment of quality control processes under GCLP regulation for clinical trials.

### PERSONAL SKILLS AND PROFESSIONAL COMPETENCES

Good competence in a broad spectrum of basic and applied science due to different field of research studied during PhD and Post-doc fellowship.

**BIOCHEMICAL COMPETENCE:** cloning technics, PCR, qPCR, sequencing of nucleic acid, nucleic acid extraction, in situ hybridization, protein extraction, western blotting, immunoprecipitation of protein complex.

**MICROBIOLOGY:** bacterial culture, transformation

**CELL CULTURE:** extraction and cultivation of human primary keratinocytes from skin biopsy of healthy donor or patients affected by Epidermolysis bullosa. Clonal analysis for stem cell isolation, cell lines cultivation, lentiviral vector and retroviral vector productions, transfection with siRNA and DNA, luciferase assay. Single-cell analysis of human primary keratinocytes with 10X Genomics platform.

**IMAGING:** histology, immunohistochemistry and immunofluorescence on human and mice tissues, confocal microscopy, optical microscopy, image processing.

**SINGLE CELL APPROCHES AND BIOINFORMATIC:** good competences in operative System(s) (Windows 98/XP/Vista™, MacOS), and other software: (Microsoft Office™, Firefox, Google suite, Photoshop and Acrobat Reader, Prism GraphPad, EndNote. Basic competences of R packages and Seurat 3 platform.

**ANIMAL MODEL:** breeding of transgenic mice, *Xenopus leavis*.

### INVOLVEMENT IN NATIONAL AND INTERNATIONAL GRANTS

Involvement as PI or Unit coordinator in the following grant:

- 2023: "High-resolution study of translational dynamics in human epithelial stem cells", PRIN 2022 funded by Ministero dell'Università della Ricerca as Unit coordinator.
- 2023: "Unravel fibroblast-epithelial crosstalk supporting keratinocytes self-renewal to improve skin graft production", funded by Leo Foundation as Co-Applicant
- 2019: "Studio del profilo epigenetico delle cellule staminali epiteliali per monitorare la sicurezza della terapia genica per la cura dell'Epidermolisi Bullosa", FAR-interdisciplinare 2019 funded by UNIMORE as PI

Involvement in the following international grants:

- 2019 ERC-2020-ADG to Michele De Luca for project "Holo-GT: Custom-designed gene editing of induced epidermal stem cells for gene therapy of genetic diseases of squamous epithelia";
- 2019: "MATURITY, A single cell-based computational platform for cellular conversion to generate functionally mature cells – application to regenerative therapies" funded by FNR to University of Luxembourg, PI Prof. Antonio Dal Sol

Involvement in the following national grants:

- 2019: "Ottimizzazione degli approcci di terapia genica per l'Epidermolisi Bollosa" funded by Debra Südtirol-Alto Adige 5x1000
- 2019: "Hologene7 2.0: L'Epidermolisi Bollosa (EB) a Modena dalla diagnosi alla terapia genica" funded by Regione Emilia-Romagna, PI Prof. Michele De Luca (POR-FESR-2014-2020 CUP E51F18000380009)
- 2018: "Hologene 7 come modello di sviluppo di una terapia avanzata a base di cellule staminali geneticamente corrette", funded by da Debra Südtirol-Alto Adige 5x1000, PI Prof. Michele De Luca
- 2014: "Hologene 7 come modello di sviluppo di una terapia avanzata a base di cellule staminali geneticamente corrette" funded by Emilia-Romagna PI Michele De Luca (POR-FESR-2014-2020 CUP E92I16000220005)
- 2013: "Phase I/II ex vivo gene therapy clinical trial for recessive dystrophic epidermolysis bullosa using skin equivalent grafts genetically corrected with a COL7A1-encoding SIN retroviral vector – GENEGRAFT funded by European Union (FP7-HEALTH-2010 n. 261392), PI Michele De Luca
- 2013: "Italian Regenerative Medicine Infrastructure (IRMI), a multiregional infrastructure for the development of advanced therapies aimed at organs and tissues regeneration" funded by M.I.U.R. PI Michele De Luca (project n. CTN01\_00177\_888744)

### CONFERENCES

Speakers as the following national or international conferences

- "Symposium on Cancer Challenges" organized by Cancer Convergence Educational Network (CCEN) & University of Rome "Tor Vergata", invited speaker in Frascati, Rome, 17-18 May 2024.
- "Tecnologie per la trascrittomiche spaziale e a singola cellula e loro applicazioni" invited speaker with the talk "Unlocking the Secrets of Epidermal Stem Cells: From Biochemical Signals to Gene Therapy with Single-Cell Transcriptomics" Bologna, 23 April 2024,
- "Italian 10x Genomics User Group Meeting": speaker at plenary session at Milan Human technopole, 14 September 2022
- "Deciphering Stem Cell Fate by Single Cell, Multiomic & Inference Approaches", Turin 30 May-1 June 2022, speaker at plenary session
- RESTORE 1st ADVANCE THERAPIES SCIENCE MEETING, Berlin 25-26/11/2019 Relator in plenary session, topic 4 "Clinical Implementation"

- UNISTEM DAY- 15 Marzo 2019 – Speaker in a event for scientific dissemination with a seminar titled: “Le cellule staminali tra scienza e fantascienza: cos’è una cellula staminale”.

Participation at the following conferences with poster:

- GORDON CONFERENCE 2023, Epithelial Differentiation and Keratinization, Barcellona 4-9 June 2023, poster title: “Elucidating DNA repair in human keratinocyte stem cells”
- ISSCR ANNUAL MEETING 2019, Los Angeles 26-29 June 2019, poster title: “Molecular fingerprint of human epidermal stem cells aimed to gene-therapy applications”
- ISSCR ANNUAL MEETING 2018, Melbourne 20-23 June 2018, poster title: “Transcriptional profile of human epidermal stem cells and stem-derived transient progenitors”
- GORDON CONFERENCE, MECHANISM OF CELL SIGNALLING, Lewistone (MA) USA, 31 Luglio -5 Agosto 2011 con poster dal titolo: Sharp1 opposes breast cancer metastasis by presenting HIF to the proteasome (Autori: Montagner M, Enzo E, Forcato M, Zanconato F, Parenti A, Rosato A, Bicciato S, Cordenonsi M, and Piccolo S
- FROM PLURIPOTENCY TO SENESECE: Molecular Mechanisms of Development, Disease and Ageing- Island of Spetses, Greece, 21-30 August 2010, poster title: “Negative control of Smad activity by Ectodermin/Tif1g patterns the mammalian embryo”

#### PRIZES AND AWARDS

- 2019 – Zhongmei Chen Yong Travel Award for scientific excellence
- 2019 – Travel award for ISSCR 2019- annual meeting
- 01/09/2008 – Prize from Telethon istitution title: TGFβ nello sviluppo embrionale del cancro
- 01/01/2009 - Scholarship CARIPARO for PhD in Biomedicine, XXIV, Università degli Studi di Padova

#### MEMBERSHIP

- Registration at “Ordine Nazionale dei Biologi” since 26/02/2020, n° AA\_084560
- SIB membership, year 2023, year 2024
- ISSCR membership, year 2019-2018-2015-2013-2024

#### List of publications (\*Co-first authorship; \*\* corresponding author)

1. Biochemical role of FOXM1-dependent histone linker H1B in human epidermal stem cells. Polito MP, Marini G, Fabrizi A, Sercia L, **Enzo E\*\***, De Luca M\*\*. *Cell Death Dis.* 2024 Jul 17;15(7):508. doi: 10.1038/s41419-024-06905-1. PMID: 39019868; PMCID: PMC11255229.
2. Challenges of enzyme therapy: Why two players are better than one. Cuoghi S, Caraffi R, Anderlini A, Baraldi C, **Enzo E**, Vandelli MA, Tosi G, Ruozi B, Duskey JT, Ottonelli I. *Nanobiotechnol.* 2024 Jul-Aug;16(4):e1979. doi: 10.1002/wnan.1979. PMID: 38955512.
3. AIPaCas: allele-specific CRISPR gene editing through a protospacer-adjacent-motif (PAM) approach. Rosignoli S, Lustrino E, Conci A, Fabrizi A, Rinaldo S, Latella MC, Enzo E, Prosseda G, De Rosa L, De Luca M, Paiardini A. *Nucleic Acids Res.* 2024 Jul 5;52(W1):W29-W38. doi: 10.1093/nar/gkae419. PMID: 38795068; PMCID: PMC11223865.
4. Allele-specific CRISPR-Cas9 editing of dominant epidermolysis bullosa simplex in human epidermal stem cells, Cattaneo C., **Enzo E.**, De Rosa L., Sercia L., Consiglio F., Forcato M., Bicciato S., Paiardini A., Basso G., Tagliafico E., Paganelli A., Fiorentici C., Magnoni C., Latella, M.C., De Luca, M. *Molecular Therapy*, 2023, doi 10.1016/j.ymthe.2023.11.027
5. Decoding the Human Epidermal Complexity at Single-Cell Resolution. Polito, M.P.; Marini, G.; Palamenghi, M.; **Enzo, E.\*\***, *Int. J. Mol. Sci.* 2023, 24, 8544. <https://doi.org/10.3390/ijms2410854>.
6. Stairways to advanced therapy for Epidermolysis Bullosa, De Rosa L\*, **Enzo E.\***, Palamenghi M.\*, Sercia L\*, De Luca M, *Cold Spring Harb Perspect Biol.* 2022 Sep 27:a041229. doi: 10.1101/cshperspect.a041229. PMID: 36167646.
7. Genetic Disorders of the Extracellular Matrix: From Cell and Gene Therapy to Future Applications in Regenerative Medicine, Chakravarti S., **Enzo E**, Monteiro de Barros M, Rizzarda Mafezzoni B, Pellegrini G., *Annual Review of Genomics and Human Genetic*, review, August 2022, 10.1146/annurev-genom-083117-021702
8. Clonal analysis of human clonogenic keratinocytes, **Enzo E\***, Cattaneo C\*, Consiglio F\*, Polito MP\*, De Luca M., *Methods in cell biology*, tematic issue in *Methods in Stem Cell Biology*, April 2022, doi.org/10.1016/bs.mcb.2022.02.009
9. Hologene 5: A Phase II/III Clinical Trial of Combined Cell and Gene Therapy of Junctional Epidermolysis Bullosa. De Rosa L\*, **Enzo E\***, Zardi G, Bodemer C, Magnoni C, Schneider H, De Luca M. *Front Genet.* 2021 Sep 1;12:705019. doi: 10.3389/fgene.2021.705019. PMID: 34539738; PMCID: PMC8440932.
10. Single-keratinocyte transcriptomic analyses identify different clonal types and proliferative potential mediated by FOXM1 in human epidermal stem cells. **Enzo E\***, Secone Seconetti A\*, Forcato M, Tenedini E, Polito MP, Sala I, Carulli S, Contin R, Peano C, Tagliafico E, Bicciato S, Bondanza S, De Luca M. *Nat Commun.* 2021 May 4;12(1):2505. doi: 10.1038/s41467-021-22779-9. PMID: 33947848; PMCID: PMC8097075.
11. Calreticulin Ins5 and Del52 mutations impair unfolded protein and oxidative stress responses in K562 cells expressing CALR mutants. Salati S, Genovese E, Carretta C, Zini R, Bartalucci N, Prudente Z, Pennucci V, Ruberti S, Rossi C, Rontauroli S, **Enzo E**, Calabresi L, Balliu M, Mannarelli C, Bianchi E, Guglielmelli P, Tagliafico E, Vannucchi AM, Manfredini R. *Sci Rep.* 2019 Jul 22;9(1):10558. doi: 10.1038/s41598-019-46843-z.
12. Regeneration of the entire human epidermis using transgenic stem cells. Hirsch T, Rothoelt T, Teig N, Bauer JW, Pellegrini G, De Rosa L, Scaglione D, Reichelt J, Klausegger A, Kneisz D, Romano O, Secone Seconetti A, Contin R, **Enzo E**,

- Jurman I, Carulli S, Jacobsen F, Luecke T, Lehnhardt M, Fischer M, Kueckelhaus M, Quagliano D, Morgante M, Bicciato S, Bondanza S, De Luca M. Nature. 2017 Nov 16;551(7680):327-332. doi: 10.1038/nature24487.
13. Closure of a Large Chronic Wound through Transplantation of Gene-Corrected Epidermal Stem Cells. Bauer JW, Koller J, Murauer EM, De Rosa L, **Enzo E**, Carulli S, Bondanza S, Recchia A, Muss W, Diem A, Mayr E, Schlager P, Gratz IK, Pellegrini G, De Luca M. J Invest Dermatol. 2017 Mar;137(3):778-781. doi: 10.1016/j.jid.2016.10.038.
  14. The sweet side of YAP/TAZ. Santinon G, **Enzo E**, Dupont S. Cell Cycle. 2015 Jun 26.
  15. Aerobic glycolysis tunes YAP/TAZ transcriptional activity. **Enzo E\***, Santinon G\*, Pocaterra A, Aragona M, Bresolin S, Forcato M, Grifoni D, Pession A, Zanconato F, Guzzo G, Bicciato S, Dupont S. EMBO J. 2015 Mar 21
  16. YAP/TAZ incorporation in the  $\beta$ -catenin destruction complex orchestrates the Wnt response. Azzolin L, Panciera T, Soligo S, **Enzo E**, Bicciato S, Dupont S, Bresolin S, Frasson C, Basso G, Guzzardo V, Fassina A, Cordenonsi M, Piccolo S. Cell. 2014 Jul 3
  17. Long-term stability and safety of transgenic cultured epidermal stem cells in gene therapy of junctional epidermolysis bullosa. De Rosa L, Carulli S, Cocchiarella F, Quagliano D, **Enzo E**, Franchini E, Giannetti A, De Santis G, Recchia A, Pellegrini G, De Luca M. Stem Cell Reports. 2013 Dec 26.
  18. BMP signaling controls muscle mass. Sartori R, Schirwis E, Blaauw B, Bortolanza S, Zhao J, **Enzo E**, Stantzou A, Mouisel E, Toniolo L, Ferry A, Stricker S, Goldberg AL, Dupont S, Piccolo S, Amthor H, Sandri M. Nat Genet. 2013 Nov.
  19. p63, Sharp1 and HIFs: master regulators of metastasis in triple-negative breast cancer. Piccolo S, **Enzo E**, Montagner M. Cancer Res. 2013 Aug 15.
  20. Self-regulation of the head-inducing properties of the Spemann organizer. Inui M, Montagner M, Ben-Zvi D, Martello G, Soligo S, Manfrin A, Aragona M, **Enzo E**, Zacchigna L, Zanconato F, Azzolin L, Dupont S, Cordenonsi M, Piccolo S. Proc Natl Acad Sci U S A. 2012 Sep 18
  21. Sharp1 suppresses breast cancer metastasis by presenting Hypoxia-inducible-Factor to the proteasome. Montagner M, **Enzo E**, Forcato M, Zanconato F, Parenti A, Rampazzo E, Basso G, Leo G, Rosato R, Bicciato S, Cordenonsi M, and Piccolo S. Nature, 2012 July 19.
  22. Fat facets deubiquitylation of Medea/Smad4 modulates interpretation of a Dpp morphogen gradient. Stinchfield MJ, Takaesu NT, Quijano JC, Castillo AM, Tiusanen N, Shimmi O, **Enzo E**, Dupont S, Piccolo S, Newfeld SJ. Development. 2012 Aug.
  23. Signaling crosstalk between TGF $\beta$  and Dishevelled/Par1b. Mamidi A, Inui M, Manfrin A, Soligo S, **Enzo E**, Aragona M, Cordenonsi M, Wessely O, Dupont S, Piccolo S. Cell Death Differ. 2012 Oct.
  24. USP15 is a Deubiquitinating Enzyme for Receptor-activated Smads. Inui M, Manfrin A., Mamidi A, Martello G, Morsut L, Soligo S, **Enzo E**, Moro S, Polo S, Dupont S, Cordenonsi M and Piccolo S. Nature Cell Biology, 2011 Sep 25.
  25. Role of YAP/TAZ in mechanotransduction. Dupont S, Morsut L, Aragona M, **Enzo E**, Giulitti S, Cordenonsi M, Zanconato F, Le Digabel J, Forcato M, Bicciato S, Elvassore N, Piccolo S. Nature. 2011 Jun 8
  26. Negative control of Smad activity by ectoderm/Tif1 $\gamma$  patterns the mammalian embryo. Morsut L, Yan KP, **Enzo E**, Aragona M, Soligo SM, Wendling O, Mark M, Khetchoumian K, Bressan G, Chambon P, Dupont S, Losson R, Piccolo S. Development. 2010 Aug 1.
  27. A MicroRNA targeting dicer for metastasis control. Martello G, Rosato A, Ferrari F, Manfrin A, Cordenonsi M, Dupont S, **Enzo E**, Guzzardo V, Rondina M, Spruce T, Parenti AR, Daidone MG, Bicciato S, Piccolo S. Cell. 2010 Jun 25

