Prof. Ennio Tasciotti, PhD
Curriculum vitae

EDUCATIONAL BACKGROUND

2000 - M.S. Biological Sciences, summa cum laudae, University of Pisa, Italy
2000 - M.S. Molecular Biology, summa cum laudae, Scuola Normale Superiore degli Studi di Pisa
2004 - Ph.D. Molecular Medicine, summa cum laudae, Scuola Normale Superiore degli Studi di Pisa and International Center for Genetic Engineering and Biotechnology (ICGEB)

CORPORATE CONSULTING AND ENTREPRENEURSHIP

2022- Founder and CSO Integra R&D srl, Rome, Italy.
2021- Founder and Director Sclavo Research Center, Siena, Italy.
2021- Founder and CSO Aella Labs Sagl, Lugano, Switzerland.
2021- Corporate Consultant for Roche Pharma, Gilead, Corden Pharma, Sclavo Diagnostic International, Novartis, AlfaSigma, Protiviti, Aboca, Inpeco, Ferrero, CORIS, Cascade Global (UK).
2021- Board Member Lightscience srl, Milan, Italy.
2020- Founder and CSO 3R Biotech srl, Milan, Italy.
2020- Board Member Friuli Innovazione srl, Udine, Italy.
2020- Scientific Advisor G-Factor, ComoNext, CubeLabs, Technoscience, THD, EOS Consulting.

SCIENTIFIC CAREER AND POSITIONS

2021- Director Human Longevity Program, IRCCS San Raffaele, Rome.
2019-2020 Vice Chair Department of Orthopedics and Sports Medicine, Houston Methodist Hospital, Houston, TX.
2017-2020 Founder and Director, Center for Musculoskeletal Regeneration, Department of Orthopedic and Sports Medicine, Houston Methodist Hospital, Houston, TX.
2016 - 2020 Founder and Director, Center for Biomimetic Medicine, Regenerative Medicine Program, Houston Methodist Research Institute, Houston, TX.
2011-2016 - Associate Professor Nanomedicine, Methodist Research Institute, Houston, TX.
2009-2011 Assistant Professor Nanomedicine, University of Texas Health Science Center at Houston (UTHSC-H), Institute for Molecular Medicine, Houston, TX.

2006-2009 Senior Postdoctoral Fellow, Nanomedicine Laboratory, Institute of Molecular Medicine, University of Texas Health Science Center, Houston, TX.
2005 - Visiting Scientist, Micro Medical Device Laboratory, Ohio State University, Columbus, OH
2005 - Postdoctoral Fellowship in Molecular Imaging, Center for Biomolecular Medicine, AREA Science Park, Trieste, Italy.
2005-2006 Postdoctoral Fellow, Molecular Medicine Laboratory, ICGEB Trieste, Italy.

ACADEMIC AFFILIATIONS

2021- Full Professor of Biotechnology, San Raffaele University, Rome.
2018-2020 Full Professor of Regenerative Medicine, Houston Methodist Hospital, Houston, TX.
2016-2018 - Associate Professor of Orthopedic Surgery, Houston Methodist Hospital, Department of Orthopedics and Sports Medicine, Houston, TX.
2010-2015 Chairman, Department of Nanomedicine, Houston Methodist Research Institute, TX.
2010-2016 Adjunct Professor of Nanomedicine, Graduate School of Biomedical Sciences (GSBS), University of Texas Health Science Center, Houston, TX.
2011-2016 Associate Professor of Nanomedicine, Institute for Academic Medicine, Houston, TX
2013-2016 Visiting Professor of Material Sciences, Chinese Academy of Sciences, Beijing.
2014-2020 Adjunct Professor of Bioceramics and Bio-hybrid Composites, Italian National Research Council, Institute of Science and Technology for Ceramics Faenza, Italy.
2015-2020 Honorary Professor, Department of Molecular Medicine and Medical Biotechnology, Center for Advanced Biotechnology, University of Federico II of Naples, Italy.
2015-2020 Honorary Professorship. Swansea University School of Medicine, UK.
2016-2020 Adjunct Professor, Texas A&M University, Dpt Molecular Cellular Medicine.
2016-2020 Adjunct Professor, Texas A&M University, Dpt of Biomedical Engineering.
2019-2020 Affiliated Member, Graduate Committee Faculty, Texas A&M University

ADMINISTRATIVE RESPONSIBILITIES

2010-2019 Member HMRI Hazardous Substances Committee
2010-2019 Member HMRI Institutional Biosafety Committee
2010-2016 Scientific Director HMRI Surgical Advanced Technology Laboratory
2011-2015 Member HMRI Scientific Council Meeting
2011-2015 Member HMRI Clinical Council Meeting
2011-2015 Member HMRI Council of Chairs
2013-2019 Member IAM Faculty Affairs Committee
2015-2019 Director HMRI Center for Biomimetic Medicine
2017-2019 Director Center for Musculoskeletal Regeneration
2019 Director of Research for Center of Excellence in Orthopedics and Sports Medicine

HONORS AND AWARDS

2000-2005 Italian Ministry of Education “Distinguished Scholar” Fellowship
2000 Molecular Biology Research Society Graduate Student Award

2001-2005 European Community "Researchers Training and Mobility Program" Fellowships
2004 Best Abstract & Travel Award, American Society for Gene Therapy, Minneapolis, USA
2006 Best Abstract & Travel Award, Society of Molecular Imaging Meeting, Minneapolis, USA
2006-2007 University of Texas Undergraduate Society Research Fellowship
2008 Best Abstract and Travel Award, World Conference on Molecular Imaging, Nice, France
2011 Best Italian Cancer Research Scientists Award, ISSNAF, Washington DC
2012 TMHRI President's Award for Transformational Excellence
2012 Moran Foundation Award in Translational Research
2013 Italy-America Chamber of Commerce "PrimiDieci Under Forty Award"
2015 TMHRI President's Award for Transformational Excellence
2016 Career Award. 6th Annual NanoScience Symposium, Houston
2017 Houston Men of Distinction Award
2018 Houston Men of Distinction Award
2020 Winner of the American Chemical Society Nano Championship

RESEARCH SUPPORT – COMPLETED

(over $14.5M of funding from 2007-2016):

1. Nanovectors for Characterization and Destruction of Breast Tumor Vasculature
National Institute of Health/National Cancer Institute (R01CA128797-03)
Role: Co-Investigator (09/28/2007-07/31/2011) ***$273,000***

2. Nanoparticles for Harvesting and Targeting Angiogenic Proteins
National Institute of Health/National Cancer Institute (R33CA122864)
Role: Co-Investigator (09/01/2008-8/31/2012) ***$375,000***

3. BioNanoScaffolds (BNS) for Post-Traumatic Osteoregeneration
Department of Defense, Defense Advanced Research Projects Agency (W911NF-09-1-0044)
Role: Co-Investigator (01/01/2009-12/31/2010) ***$7,865,000***

4. Individualized cancer therapy: Leveraging medicine with multistage vector technology
Department of Defense CDMRP BCRP (W81XWH-09-1-0212)
Role: Co-Investigator (03/01/2009-02/28/2010) ***$1,386,000***

5. BioNanoScaffolds (BNS) for Post-Traumatic Osteoregeneration
Department of Defense, Defense Advanced Research Projects Agency (W911NF-11-1-0266)
Role: Principal-Investigator (10/01/2010- 8/10/2013) ***$828,000***

6. A hybrid "leukolike" multistage delivery system to overcome biological barriers
Department of Defense, Alliance for Nano-Health (ANH) Seed Grant (W81XWH-10-2-0125)
Role: Co-Investigator (04/15/2011 - 04/14/2013) ***$151,000***

7. Cell-mediated targeted delivery of nanoparticles for anti-tumor effect
Alliance for NanoHealth Collaborative, Multi-Institutional Center Grant (W81XWH-09-2-0139)
Role: Co-Investigator (09/30/2011–09/28/2013) ***$200,000***

8. Targeted Multistage Vector for the Diagnosis and Treatment of tumors of the intestinal tract.
Italian Ministry of Health (RF-2010-2305526 – PI: Nitti)
Role: Co-Investigator ***$252,500***

9. Leukosomes for the Targeted Treatment of Inflamed Endothelial and Atherosclerotic Plaques
George and Angelina Kostas Research Center

Role: Principal Investigator (07/01/2014-06/31/2015) ***$100,000***
10. Transport, diffusion and retention phenomena of nanovectors in the tumor parenchyma
NIH; PSOC Pilot Project (5U54CA143837)
Role: Principal-Investigator (03/01/2014-02/28/2015) ***$50,000***
11. Neuroregenerative Medicine Research Project
Brown Foundation for Healthcare
Role: Principal Investigator (05/01/2012-04/31/2015) ***$200,000***
12. Leukocyte Membrane Cloaked Carriers to Target and Overcome Tumor Vasculature
National Institute of Health/National Cancer Institute (1R21CA173579-01A1)
Role: Principal Investigator (07/01/2013-06/30/2015) ***$275,000***
13. Multistage Vector-Enabled Breast Oncology
Department of Defense (W81XWH-12-10414)
Role: Principal Investigator (09/30/2012-09/29/2017) ***$250,000***
14. New nanotechnology and biomedical approaches to improve postoperative pain treatment reducing the risks related to opioids.
Italian Ministry of Health (GR-2010-2318370, PI: Allegri)
Role: Co-Investigator (01/01/2013-12/31/2016) ***$1,275,000***
15. Novel surface targets for tailored nanotechnology-based drug delivery in colorectal cancer
Italian Ministry of Health (RF-2010-2318372 PI: Salvatore)
Role: Co-Investigator (01/01/2013-12/31/2016) ***$800,000***
16. Biomimetic Drug Delivery
Hearst Foundation
Role: Principal Investigator (07/30/2014-12/31/2016) ***$250,000***

RESEARCH SUPPORT - CURRENT
(over $15.6 M of secured funding from 2014-2021):
1. Biomimetic Regenerative Medicine Program
The Cullen Trust for Health Care
Principal Investigator (01/01/2014-04/30/2019) ***$3,000,000***
2. Spinal Cord Injury Research
Department of Defense (W81XWH-14-1-0600)
Co-Investigator (09/30/2015-09/29/2020) **$555,000**
3. A GMP/GLP investigation of degradable polymeric shells for traumatic osteoregeneration
U.S. Army Medical Research and Materiel Command (USAMRMC W81XWH-BAA-14-1)
Principal Investigator (01/01/2015-12/31/2021) ***$6,271,500***
4. A proteomic approach for the optimization of personalized biomimetic nanoparticles (BNV)"
Cariparo Foundation
Principal Investigator (04/01/2016-03/31/2020) ***$493,000***
5. EAGER: Biomanufacturing: Cell Differentiation Bioreactor For Cardiac Tissue Engineering
National Science Foundation (PI: Jeffrey Jacot)
Co-Investigator (09/15/2016 – 08/31/2019) ***$300,000***
6. Targeting the Inflammatory Cancer Stem Cell Microenvironment of Triple Negative Breast Cancer with Leukocyte-mimetic Nanovesicles

CPRIT (RP170466)
Principal Investigator (12/01/16 - 11/30/20) ***$897,000***
7. Biomimetic nanovesicles to overcome multiple physiological barriers for primary and metastatic triple negative breast cancer therapy
National Cancer Institute (R56 CA213859-01)
Principal Investigator (9/01/2017 to 8/31/2020) ***$393,500***
8. RNAi approaches delivered through biomimetic nanoparticles to target EZH2 in pediatric soft-tissue sarcomas
Italian National Cancer Institute (PI: Zaffaroni)
Co-Investigator (11/1/2017-10/30/2020) ***$431,500***
9. A New Biomimetic Approach in the Treatment of Cardiovascular Inflammation
Kleberg Foundation
Principal Investigator (01/01/2018 to 12/31/2021) ***$867,500***
10. Cardiopatch: a biomimetic scaffold to fix congenital heart defects
Men of Distinction
Principal Investigator (05/01/2018 to 04/30/2020) ***$100,000***
11. Reverting Inflammatory Bowel Disease with biomimetic Nanoparticles
Underwood Center for Digestive Diseases
Co-Principal Investigator (01/01/2018 to 12/31/2020) ***$200,000***
12. Targeting the metastatic sarcoma niche using leukocyte biomimetic nanoparticles
Cancer Prevention Research Institute of Texas (CPRIT)
Principal Investigator (03/01/2018-02/28/2021) ***$1,199,500***
13. Imaging elevated interstitial fluid pressure in tumors using ultrasound elastography
National Institute of Health
Co-Investigator (09/30/2018-09/29/2021) ***$416,500***
14. Assessment of breast cancer mechanopathology markers using ultrasound
Department of Defense, Breast Cancer Research Program
Co-Principal Investigator (09/30/2018-09/29/2021) ***$480,000***

SERVICE ON REVIEW PANELS & STUDY SECTIONS

CRMRP Restorative Transplantation Research (2010, 2015)
International Scientists and Scholars in North America Foundation (ISSNAF) (2010-2016)
NIH IMAT Panel on "Innovative Technologies Development" (2010, 2014, 2016, 2017)
French National Cancer Institute (INCa) (2010, 2012, 2014)
U.S.-Israel Binational Science Foundation (2012, 2015, 2017)
NIH Drug Discovery and Molecular Pharmacology Study Section (2014)
DoD USA-MRMC Congressionally Directed Medical Research Programs (CDMRP) (2014-present)
The University of Strasbourg Institute for Advanced Study (USIAS) (2015)
NIH Image Guided Drug Delivery in Cancer Study Section. (2015-present)
DoD Nanomaterials for Bone Regeneration Focused Program Award Study Section (2015-2017)
The Israel Science Foundation (ISF) (2015-present)
NIH Enabling Tissue-Engineered Technologies for Cancer Research (U01 program) (2016)
Swiss National Science Foundation (2016)

NIH Image Guided Drug Delivery (Special Emphasis Panel) (2016-present)
NIH National Institute of Biomedical Imaging and bioengineering (Special Emphasis Panel on Regenerative Medicine Innovation project) (2017)
French research national agency (2017-2019)
European Research Council Grants (2018)
National Cancer Institute: "Clinical and Translational Exploratory/Developmental Studies (2018)
DoD CDMRP Breast Cancer Research Program Clinical and Experimental Treatment (2018)
NIH NIDDK: Immune System Engineering For Type 1 Diabetes. RFA-DK-17-020 (2018)
NIH Drug Discovery and Molecular Pharmacology (DMP) Study Section (2019)
NIH ESI MIRA Biotech Panel (Special Emphasis Panel) (2019)
Netherlands Organization for Scientific Research (2019)
Austrian Science Fund (2019)

SCIENTIFIC LEADERSHIP ROLES

Strategic partner of Technoscience Park Rome, Italy. (2019-2022)
Scientific Advisor TMCx - Texas Medical Center Incubator/Accelerator, TX. (2016-2019)
Extramural Funding Advisory Committee. Texas A&M Health Science Center, TX. (2018-2019)
Junior Cabinet Member, President Leadership Council Advisory Board. (2015-2018)
Organizer and Session Chair, Conference of the Italian Researchers in the World. (2012- 2018)
President, Italian Ministry of Health Grant Review Panel. (2012-2015)
Scientific Leadership Committee, Young Against Pain, Italy. (November 2014)
Organizer and Conference Chair, Materials in Medicine, Italy. (October 2013)
Director, Accademia delle Nanoscienze, Italy. (2011-2016)

SCIENTIFIC REVIEWER

Nature Materials
Nature Biotechnology
Nature Nanotechnology
Nature Methods
Nature Protocols
Nature Biomedical Engineering
Science Translational Medicine
Advanced Materials
ACS Nano
Advanced Drug Delivery Reviews
Materials Today
Small
Biomaterials
Acta Biomaterialia
Advanced Healthcare Materials
ACS Applied Materials & Interfaces
Advanced Functional Materials

Biomedical Microdevices
Clinica Chimica Acta
Journal of Biological Chemistry
Molecular Imaging
Nanomedicine & Nanobiotechnology
Journal of the American Chemical Society
Biomedical Nanotechnology
Drug Development
Journal of Physical Chemistry
Journal of Biomaterials Science
Journal of Biomedical Nanotechnology
Journal of Medicinal Chemistry
Chemical Research in Toxicology
Proteomics
Pharmaceutical Science and Technology
Cancer Research Journal
Journal of Visualized Experiments
International Journal of Molecular Sciences
Journal of Applied Biomaterials & Functional Materials
Material Sciences and Nanotechnology
Molecular Imaging
Molecular Pharmaceutics
Trends in Biotechnology
Trends in Immunology

MEMBERSHIPS TO PROFESSIONAL SOCIETIES

Biomedical Engineering Society (2006-present)
American Association for Cancer Research (2006-present)
Society for Molecular Imaging (2007-present)
American Association for the Advancement of Science (2009-present)
American Chemical Society (2009-present)
Controlled Release Society (2010-present)
Society for Biomaterials (2010-present)
American Society for Cell Biology (2015-present)
International Cartilage Repair Society (2017-present)
Società Italiana di Leadership e Management in Medicina (2021-present)

KEY SCIENTIFIC CONTRIBUTIONS

1. ***Drug delivery.*** I have investigated the use of micro-, nano- and bio-materials for drug delivery applications. By combining nanotechnology with cell biology, I created innovative medical tools that work within the laws of nature. In particular, I focused on developing implantable and injectable platforms to overcome biological barriers, target inflammation, deliver drugs to cancer

and tune immune response. The Multi Stage Vector (Nature Nanotechnology, Dec 2008 cover story) was the first nanosystems for targeted chemotherapy I developed. It was selected as one of the "Five big ideas for nanotechnology" (Nature Medicine, 2009), and opened a new field of investigation: multi-stage delivery. To date, close to 250 peer reviewed papers have been published on the multistage technology, which is now being translated to the clinic by a private company. My research in drug delivery resulted in additional platforms able to negotiate and overcome biological barriers. I pioneered the use of the principles of biomimicry to create bioinspired systems able to prevent reticulo-endothelial clearance, target inflamed vessels, cross the endothelial layer, and increase therapeutic accumulation in the cytoplasm. Among the most important: the Leuko-Like Vector (Nature Nanotechnology, 2013); the porous nanoneedles (Nature Material, 2015); the exosome-like vesicles (Nature Material 2016). The goal of my current research is the development of universal delivery systems to target inflammation, and release drugs and molecules specific to the disease.

2. *Regenerative Medicine.* My laboratory has demonstrated the incredible healing capabilities of the body and worked to harness them to their fullest potential by creating biomimetic scaffolds able to elicit desired cell and tissue responses. Our materials are designed to mimic tissue response during the physiologic healing process. Through our studies, we showed that immune and stem cells respond to an implanted material according to its composition, structure and surface properties. Our work in tissue engineering pioneered the synthesis of scaffolds and membranes that mimic native tissue at the nano- and micro-scale in order to bestow the function of natural tissues upon synthetic constructs. The demand for products with ideal properties for surgical applications in regenerative medicine remains high. My personal interest is to develop translational biomaterials for musculoskeletal tissue engineering. These tissues are multi-composite structures composed of cartilage, bone, tendons, ligaments and connective tissue, typically in continuity with each other. One limitation of current approaches is to regenerate only one tissue at a time. My strategy is to mimic the extracellular matrix of multiple tissues in order to achieve better regeneration of the composite tissues.

***3. Immune and stem cell biology*.** My laboratory contributed to the understanding of mesenchymal stem cell and immune cell response to biomaterials. I have demonstrated that it is possible to direct cell fate inside the body, without the need for ex vivo cell expansion or manipulation, thus simplifying the process of FDA approval and accelerating the clinical translation of implantable scaffolds. At a time when most laboratories worked to develop tissue engineering approaches based on bioreactors and ex vivo cell culture on scaffolds, we were among the first to develop technologies that leveraged immune cells' activity as first-responders after injury to recruit stem cells and promote neoangiogenesis. My innovative approach to biomaterials engineering is focused on the control of the response of inflammatory cells to the implant. We demonstrated that regenerative processes are dependent on a complex dialogue between multiple cell types, involving the chemical and physical cues provided by the surrounding microenvironment. We characterized the cascade of inflammatory events triggered by the host's immune system in response to an implanted biomaterial and showed that the ativation of M1 macrophages leads to adverse immune dysfunction, fibrosis and pathological complications. Conversely, M2 switching is associated with faster tissue healing and can prevent

scar tissue formation. To augment implant biocompatibility and minimize immunogenic response my team developed several immune-instructive biomaterials able to tune the immune-response toward a better regeneration.

4. Translational research. Broadening our biomimetic approach to unsolved clinical problems, I established a program in the use of platelet-rich plasma as a biomaterial for regenerative medicine. We demonstrated that this blood-derived product greatly enhance early neovascularization and tissue deposition, mediates immunomodulation, and dampens host degradation of biologic matrices. We investigated novel regenerative matrices such as repurposed lung tissue, which, through a complex decellularization process, can provide architectural and biochemical cues to native cells to improve incorporation, cellularization, and neovascularization. Finally, we contributed to the development of novel imaging modalities, such as ultrasound elastography, to understand the progressive mechanisms of hard and soft tissue healing. Together these findings have significant immediate translational implications for human surgical care, diagnosis and healing going forward.

INVITED LECTURES: Selected from over 60 seminars and invited lectures in universities and research centers in the United States, Canada, Europe, China, and Japan.

"**Nanotechnology in Medicine: Lessons Learned and New challenges.**" International Conference on Computational Surgery. Boston, MA. (10 December 2012)
"**Biomimetic Strategies to Target and Tune Inflammation.**" Hamon Center Lab Conference: Cancer Symposium. Dallas, TX. (12 March 2015)
"How nanomaterials will change the way we practice medicine." The Department of Surgery Grand Rounds. MD Anderson Cancer Center, Houston, TX. (14 October 2015)
"**Nanotechnology in Pain Medicine**." American Society of Regional Anesthesia and Pain Medicine. Miami, FL. (20 November 2015)
"**Biomimetic proteolipid vesicles derived from immune cells.**" American Society for Cell Biology Annual Meeting. San Diego, CA. (12 December 2015)
"**Biomimetic materials to overcome biological barriers in drug delivery & tissue engineering.**" Biomaterials Day. Rice University. Houston, TX. (1 June 2015)
"Membrane Source determines fate of biomimetic particle." World Conference on Nanoengineering for Medicine and Biology. San Francisco, CA. (2-5 February 2014)
"Biologically Inspired Scaffold Mimicking Trabecular Bone for Spinal Fusion." Society For Biomaterials. Charlotte, North Carolina. (15-18 April 2015)
"Nanotechnology platforms for acute post surgical pain." American Society of Regional Anesthesia and Pain Medicine. Miami, FL. (November 21-24 2015)
"**Promoting musculoskeletal repair and physiologic tissue homeostasis through the mimicking of the regenerative niche.**" Nature Conference on Tissue Engineering and Regenerative Medicine. Guangzhou, China. (6-9 April 2016)
"Biomimetic interfaces to trigger tissue restoration." World Biomaterials Conference, Montreal, QC. (17-22 May 2016)

"**Targeting inflammation and tuning the immune response using biomimetic nanomaterials.**" Center for Prevention of Obesity. Omaha, NB. (18 April 2016)
"Cellular vectors to enhance the pulmonary delivery of chemotherapeutics." World Drug Delivery Summit. New Orleans, LA. (30 June – 02 July 2016)
"**Biomimetic Liposome-like Nanovesicles able to Target and Modulate Inflammation**." Clinical NanoMedicine Conference (CLINAM). Basel, Switzerland. (May 7 -10, 2017)
"**Biomimetic Engineering of Materials to Tune Immune Response and Inflammation**." Cancer Nanotechnology Gordon Research Conference, Mt. Snow, VT. (June 18-23, 2017)
"**Synthetic proteolipid vesicles mimicking leukocyte membrane function**." Nano Drug Delivery Symposium, Ann Arbor, MI. (September 22-24, 2017)
"**Targeting Cancer Inflammatory Microenvironment with Biomimetic Nanoparticles**." End2Cancer conference, Oklahoma City, OK. (December 14-15, 2017)
"**Designing materials to increase the nano-bio interface**." University College Dublin, Centre for BioNano Interactions, Dublin. (May 15, 2018)
"**Targeting inflammation with immune derived nanoparticles**." Technical University of Denmark, Copenhagen, Denmark. (May 18, 2018)
"**Nanoparticles for nucleic acid therapy**." Advancing Toward a One-Time Cure. Cystic Fibrosis Foundation Research Conference, Jackson, WY. (June 22-24, 2018)
"**How to Target Inflammation and Tune the Immune Response with Biomimetic Nanoparticles**." Center for Molecular Imaging and Nanotechnology (CMINT) Memorial Sloan-Kettering Cancer Center. New York, NY. (June 20, 2019)
"What is the future of cancer nanomedicine and what can we learn from past failures" Gordon Research Seminar on Cancer Nanotechnology. West Dover, VT. (June 22-26, 2019)
"**Biomimetic materials to tune immune response and direct stem cell lineage"** UTHealth School of Dentistry. Houston, TX. (September 4, 2019)
"Immune tuning and anti-inflammatory response to nano and biomaterials" Center for Inflammation and Immunology, Humanitas Clinical and Research Center. Milan, Italy. (September 26, 2019)
"Targeting Inflammation with Biomimetic Nanomaterials" Nanoscience and Nanotechnology for Medical Applications, Tel Aviv university. Tel Aviv Israel (October 29-30, 2019)

PODIUM PRESENTATIONS: Selected from over 250 international scientific meetings. Over 300 scientific communications have been presented by members of my team and collaborators.

"Nanoporous Silicon as a Platform for Targeted Drug Delivery and Discovery of Proteomic Signatures for Cancer Diagnostics." **Nanomedical and Telemedical Conference**, Montreal, Canada. (24 – 28 February 2009)
"Nanotechnologies and the Individualization of Medicine." **American Association for Cancer Research Centennial Meeting**, Denver, Colorado. (17 – 21 April 2009)
"Stem cell-directed theranostic nanovectors for cancer intervention." **TechConnect World.** Anaheim, CA. (21-25 June 2010)
"Trifunctional Porogens for the Development of an Injectable Putty to Treat Traumatic Bone Defects." **Controlled Release Society Meeting**. Portland, Oregon. (10-14 July 2010)

"Nanoporous silicon nanoneedles for intracellular delivery of SiRNA." **International Conference on Science and Technology.** Madrid, Spain. (28 March – 1 April 2012)
"Injectable and implantable biomimetic materials for tissue engineering" **World Biomaterials Conference**, Chengdu, China. (5-12 June 2012)
"Multidisciplinary approaches in Nanomedicine." **Building Global Engagements in Research**. Swansea, UK. (25-27 February 2013)
"Healing tissues through biomimetic materials." **Materials in Medicine International Conference**. Faenza, Italy. (8-11 October 2013)
"Bioengineered Nanoporous Silicon with Leukocyte Membrane Promotes Endothelial Adhesion." **Biomedical Engineering Society Meeting**. San Antonio, Texas. (24 October 2014)
"Targeting inflammation with biomimetic materials." **Engineering in Medicine and Biology. Micro and Nanotechnology in Medicine Conference**. Oahu, Hawaii. (8-13 December 2014)
"Biomimetic approaches for tissue healing and restoration." **Society For Biomaterials**, Charlotte, North Carolina. (15-18 April 2015)
"Engineering Tissue Interfaces." **Tissue Engineering and Regenerative Medicine International Society**. Boston, MA. (20 September 2015)
"Leukocyte-based Biomimetic Nanovesicles for the Imaging of Inflamed Vasculature." **NanoEngineering for Medicine and Biology Conference**. Houston, TX. (February 2016)
"Modeling breast cancer with tridimensional biomimetic scaffolds." **Clinical Nanomedicine Conference**, Basel, Switzerland. (26-29 June 2016)
"Biomimetic Nanomaterials for Drug Delivery and Tissue Engineering." **NanoWorld Conference**. Boston, MA. (4-6 April 2016)
"Multifunctional Fibrin/PEG Hydrogels for Congenital Heart Repair." **World Biomaterials Congress**, Montreal, QC. (17-22 May 2016)
"Drug Delivery Systems to Overcome Biological Barriers." **World Drug Delivery Summit**, New Orleans, LA. (30 June – 02 July 2016)
"Biomimetic Liposome-like Nanovesicles able to Target and Modulate Inflammation." **10th European & Global Summit Nanomedicine.** Basel, Switzerland. (7-10 May 2017)
"Biomimetic nanomaterials to target inflammation and tune immune response." **National Institute for Health-National Cancer Institute Director's office**, Bethesda, VA. (17 April 2018)
"Induction and Modulation of Immune Response for Tissue Regeneration." **Tissue Engineering and Regenerative Medicine International Society**. Kyoto, JP. (4-8 September 2018)
"Biomimetic Scaffolds to Modulate Inflammation and Improve MSC Inflammatory Targeting" **Biomedical Engineering Society 2019 Annual Conference**. Philadelphia, PA. (17 October 2019)

OUTREACH PRESENTATIONS: I have been active in the dissemination of science and regularly participate in round tables and conferences for the general public. This included presentations at philanthropic events which raised over $5 M for my own laboratory and $25 M for my institute. The following are selected from a list of over 50 public engagements:

"**Nationwide celebration of nanotechnology for children and families**." NanoDay and ScienceDay. These are two annual hands-on festivals where youngsters celebrate the wonders of science. Designed for junior scientists in grades K-12, this medical science and technology event

has hands-on activities the entire family can enjoy. Houston Methodist Research Institute, Houston TX. The events have been hosted regularly in Houston from 2013 to 2019.

"**Regenerative Nanomedicine**" Faith and Medicine Initiative. This initiative focused on the role of Supportive and Palliative Care service in the hospital setting. Guests had the opportunity to hear from and interact with experts in pain therapy and palliative care, and to gain a better understanding of how they can be best integrated into the health care teams. River Oaks Country Club, Houston TX. 21 October 2013.

"**Leukosomes vescicles to target cardiovascular diseases**" Congressional Delegation Visit, Hosting Congressman John Culberson, member of the House Appropriations Committee, and chair of the Subcommittee on Commerce, Justice, and Science (CJS). The CJS Subcommittee has jurisdiction over the Department of Commerce, Department of Justice, NASA, the National Science Foundation, and other related agencies. Washington DC, 9 January 2014.

"**Bone Putty Regenerative Tissue**" Congressional Delegation Visit, Hosting Congressman Gene Green. Houston Methodist Research Institute. Houston, TX. 25 Aug 2014.

"**From Science Fiction to Reality and Running Backward in Time**." Houston Methodist Research Institute, Houston TX. 21 October 2014.

"**Your Future with Nanomedicine.**" Houston Rotary Club Fundraising Event, with the participation of the Oil and Gas executive community. Houston, TX. 06 November 2014.

"**Musculoskeletal tissue repair with immune instructing materials.**" Congressional Delegation Visit of Congressman Pete Olson. Houston Methodist, TX. 14 December 2014.

"**Regenerative Medicine**." The Bush Family Campaigning Tour. An exclusive reception featuring the latest advances in medical research aimed at treating society's most devastating diseases. Clinicians and scientists shared their insight on the Translational Research Initiative an innovative approach to translate discoveries made in the laboratory into new diagnostics, therapies and treatments. Houston Methodist Research Institute. Houston, TX. 27 April 2015.

"**Targeted cancer therapy using nanoparticles for drug delivery.**" TRI Reception hosted by Veronica Selinko-Curran and Mike Curran. An evening reception featuring clinicians and researchers from the Texas Medical Center. The event showcased biomeical innovations already underway to address some of society's most challenging diseases and conditions. Houston Methodist Research Institute, Houston, TX. 30 March 2016.

"**Regenerative Engineering: how to leverage on the lessons learned from Nature.**" Maria Bush Campaigning Tour. Houston Methodist Research Institute. Houston, TX. 27 April 2015.

"**Biomimetic Strategies for the Treatment of Atherosclerosis.**" George and Angela Kostas Center for Cardiovascular Nanomedicine. Houston, TX 12 October 2015.

"**3D biomimetic scaffolds: a tissue-like context for studying tumor biology and drug response.**" Scientists Meet the Patients Symposium. Houston, TX 2015. 46.

"Building bionic nanomachines to overcome biological barriers" Atomic Precision for Medical Applications. A highly interactive and stimulating invitational meeting focused on long-term prospects for revolutionary advances in medical applications based on improved precision in our control of matter, and how to spend current research in that direction. Foresight Institute. San Jose, California. 29-31 May 2015.

"**The Benefits of Scientist-Clinician Driven research.**" The Society for Leading Medicine's Night at the Research Institute. This event gives the opportunity to the members of The Society for

Leading Medicine and their families to enjoy a night of exploration and to learn about nanoscience, technology and medicine. Houston Methodist, Houston, TX. 26 September 2016.
"**To kill cancer you have to think like a cell**" TedX-Talk CNR: 10 October 2016, Rome, Italy
"**Approaches to the treatment of inflammation in traumatic injuries**" Brain & Bone Collaborative Event. The event was organized to increase awareness and gain support of the concussion and traumatic brain injury program at Houston Methodist. Houston Methodist Research Institute, Houston, TX. 03 April 2017.
"**Specialized leukosome for the treatment of Inflammatory Bowel Disease**" Gastroenterology Task Force Meeting. The GI Task Force aims to increase awareness and gain more support from the families of patients affected by incurable digestive disorders. The David M. and Lynda K. Underwood Center for Digestive Disorders. Houston, 10 April 2017.
"**Biomimetic Scaffolds for the Treatment of Musculoskeletal Injuries**" Brain & Bone Collaborative Center, Presentation to further engage individuals with an interest in Sports Medicine, Orthopedics and Concussion. Jon Deutser Residence, 19 October 2017.
"**Personalized nanomedicine approaches to inflammatory conditions**" This luncheon engaged special guests in The Power of M Campaign and The Centennial Chair Challenge. Luncheon hosted by Claudia and Roberto Contreras, 5 December 2017.
"**New approaches to musculoskeletal regeneration**" The Breakfast Club. A networking and fundraising event including 50 top executives from the oil and gas industry. River Oak Country Club, Houston, August 22, 2018.
"**Immunology Reception."** A reception hosted by Cindy and Don Poarch featuring Houston Methodist Immunology Center and David Huston, MD. Poarch Residence, 21 March 2019.
"**What it takes to be a scientist today**" STE(A)M IT project, European Community, Sept 2020.

PATENTS

Biomimetic proteolipid vesicle compositions and uses thereof

Publication number: 20190167589 **Abstract:** Disclosed are biomimetic proteolipid nanovesicles that possess remarkable properties for targeting compounds of interest to particular mammalian cell and tissue types. In particular embodiments, drug delivery vehicles are provided composed of synthetic phospholipids and cholesterol, enriched of leukocyte membranes, and surrounding an aqueous core. These nanovesicles are able to both avoid the immune system, thanks to the presence on their surface of self-tolerance proteins, as CD-45, CD-47, and MHC-1, and target inflamed endothelium, thereby diffusing in the tumor microenvironment. These properties make the composition highly suited for targeted drug delivery to mammalian tumor cells in vitro and in situ.
Filed: August 22, 2018 **Publication date:** June 6, 2019 **Applicant:** Houston Methodist Hospital **Inventors:** Ennio Tasciotti, Roberto Molinaro

Trizonal membranes for periosteum regeneration

Publication number: 20190151510 **Abstract:** Disclosed are trilaminate collagen-based tissue scaffolds that exhibit remarkable morphological mimicry to that of the natural mammalian periosteum tissue they are useful in remodeling. In particular embodiments, periosteum-

modeling trizonal membranes for reforming and regrowing human bone tissue are provided that are composed of a first zone of compact collagen, a second layer of collagen-elastin, and a third layer of biomineralized collagen.
Filed: August 22, 2018 **Publication date:** May 23, 2019 **Applicant:** Houston Methodist Hospital **Inventors:** Ennio Tasciotti, Francesca Taraballi, Silvia Minardi

Microfluidic-formulated leukosome compositions and fabrication methods therefor

Publication number: 20190117572 **Abstract:** Disclosed are methods for designing and manufacturing biomimetic proteolipid nanovesicles using a microfluidic approach, and in particular, a NanoAssemblr®-based platform, which allows for the high-throughput, reproducible, and scalable production of nanoparticles, without affecting their pharmaceutical and biological properties. These nanovesicles, which are composed of synthetic phospholipids and cholesterol, enriched of leukocyte membranes, and surrounding an aqueous core, possess remarkable properties for targeting compounds of interest to particular mammalian cell and tissue types.
Filed: March 7, 2018 **Publication date:** April 25, 2019 **Applicant:** Houston Methodist Hospital **Inventors**: Ennio Tasciotti, Roberto Molinaro

Biodegradable scaffolds

Publication number: 20190001025 **Abstract:** In some embodiments, the present invention provides compositions that comprise: (1) a biodegradable polymer matrix; and (2) at least one biodegradable reinforcing particle that is dispersed in the matrix. In some embodiments, the biodegradable reinforcing particle is selected from the group consisting of porous oxide particles and porous semiconductor particles. In additional embodiments, the compositions of the present invention further comprise a (3) porogen particle that is also dispersed in the matrix. In further embodiments, the compositions of the present invention are also associated with one or more active agents. In various embodiments, the active agents are associated with the biodegradable polymer matrix, the biodegradable reinforcing particle, and/or the porogen particle. In various embodiments, the compositions of the present invention may be utilized as scaffolds, such as scaffolds for treating bone defects.
Filed: August 27, 2018 **Publication date:** January 3, 2019 **Applicant:** Board of Regents of the University of Texas System **Inventors:** Mauro Ferrari, Rachel Buchanan, Christine Smid, Ennio Tasciotti

Multistage delivery of active agents

Publication number: 20190111000 **Abstract:** Multistage delivery vehicles are disclosed which include a first stage particle and a second stage particle. The first stage particle is a micro or nanoparticle that contains the second stage particle. The second stage particle includes an active agent, such as a therapeutic agent or an imaging agent. The multistage delivery vehicle allows sequential overcoming or bypassing of biological barriers. The multistage delivery vehicle is administered as a part of a composition that includes a plurality of the vehicles. Methods of making the multistage delivery vehicles are also provided.

Filed: October 12, 2018 **Publication date:** April 18, 2019 **Applicants:** Board of Regents of the University of Texas System, The Ohio State University Research Foundation **Inventors:** Mauro Ferrari, Ennio Tasciotti, Jason Sakamoto

Implantable electrospun patches for site-directed drug delivery

Publication number: 20180361032 **Abstract:** Disclosed are biocompatible, biodegradable, implantable devices for the controlled release of bioactive molecules. In particular embodiments, nanotechnology-based tunable implants are disclosed for 1) localized delivery of analgesics to treat postoperative pain; 2) sustained delivery of growth factors to promote vascularization; and 3) directing tissue regeneration, including the self-direction of autologous stem cells for organ remodeling.
Type: Application **Filed:** August 22, 2018 **Publication date:** December 20, 2018 **Inventors:** Ennio Tasciotti, Francesca Taraballi, Silvia Minardi

Modular device for preventing compression and instability in a segmental defect repair

Publication number: 20170086978 **Abstract:** The present invention relates to a polymer scaffold design and method for treating segmental long bone defects without amputation that permits permanent regrowth of bone in the area of the segmental defect, without external fixation or other problems inherent in current systems. The polymer scaffold is preferably made from a poly(ester urea) polymer and includes an outer shell, sized to fit over a segmental defect in a bone, and a collagen containing material. In some embodiments, the collagen containing material is placed in a polymer insert sized to fit within the segmental bone defect and within said outer shell. In some embodiments, the outer shell may contain struts running longitudinal struts along the inside surface of the outer shell. In some of these embodiments, the insert will have a corresponding set of grooves sized to receive the struts.
Filed: May 13, 2015 **Publication date:** March 30, 2017 **Applicants:** The University of Akron, Houston Methodist Hospital **Inventors:** Matthew Becker, Ennio Tasciotti, Bradley Weiner

Theranostic delivery systems with modified surfaces

Publication number: 20130071329 **Abstract:** The present invention pertains to therapeutic compositions and delivery systems comprising at least one microparticle or nanoparticle. In various embodiments, the surface of the microparticle or nanoparticle is modified or functionalized with at least a portion of an isolated cellular membrane, such as an isolated plasma membrane. In addition, the microparticle or nanoparticle contains at least one active agent, such as a therapeutic and/or imaging agent. In additional embodiments, the compositions and delivery systems of the present invention may be used for targeted delivery of an active agent. Also provided are methods of making the therapeutic compositions and delivery systems of the present invention.
Filed: March 17, 2011 **Publication date:** March 21, 2013 **Applicant:** Board of Regents of the University of Texas System **Inventors:** Mauro Ferrari, Ennio Tasciotti, Nicoletta Quattrocchi

Universal cell-directed theranostics

Publication number: 20130071326 **Abstract:** The present invention provides modified stem cells that comprise a delivery system that comprises at least one microparticle or nanoparticle,

wherein the at least one microparticle or nanoparticle comprises an active agent. The present invention also provides delivery methods that comprise the administration of the modified stem cells to a subject. Additional aspects of the present invention pertain to methods of making said modified stem cells.
Filed: March 17, 2011 **Publication date:** March 21, 2013 **Applicant:** Board of Regents of the University of Texas System **Inventors:** Jonathan O. Martinez, Ennio Tasciotti, Mikhail Kolonin, Mauro Ferrari

Combinatorial multidomain mesoporous chips and a method for fractionation, stabilization, and storage of biomolecules
Publication number: 20110065207 **Abstract:** A new fractionation device shows desirable features for exploratory screening and biomarker discovery. The constituent MSCs may be tailored for desired pore sizes and surface properties and for the sequestration and enrichment of extremely low abundant protein and peptides in desired ranges of the mass/charge spectrum. The MSCs are effective in yielding reproducible extracts from complex biological samples as small as 10 ul in a time as short as 30 minutes. They are inexpensive to manufacture, and allow for scaled up production to attain the simultaneous processing of a large number of samples. The MSCs are multiplexed, label-free diagnostic tools with the potential of biological recognition moiety modification for enhanced specificity. The MSCs may store, protect and stabilize biological fluids, enabling the simplified and cost-effective collection and transportation of clinical samples.
Filed: July 20, 2010 **Publication date:** March 17, 2011 **Applicant:** The Board of Regents of the University of Texas System **Inventors:** Mauro Ferrari, Xuewu Liu, Ennio Tasciotti, Ali Bouamrani

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