BIOGRAPHICAL SKETCH

NAME:Anna Urciuolo

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POSITION TITLE: PhD

EDUCATION/TRAINING

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Start Date MM/YYYY	Completion Date MM/YYYY	FIELD OF STUDY
University of Padua, Dept. of Histology, Microbiology and Medical Biotechnology, Italy	Master's Degree in Medical Biotechnology	09/2005	07/2007	Autosomal recessive myosclerosis myopathy is a collagen VI disorder
University of Padua, Dept. of Histology, Microbiology and Medical Biotechnology, Italy	PhD in Bioscience, curriculum "Genetics and Developmental Biology"	01/2008	04/2011	Role of extracellular matrix in skeletal muscle dystrophies and regeneration
University of Padua, Dept. of Molecular Medicine, Italy	Research Associate	05/2011	09/2013	Role of extracellular matrix in skeletal muscle stem cell niche and regeneration
University College London, Stem Cell and Regenerative Medicine Section, UK	Research Associate	02/2014	12/2015	Decellularized organs for regenerative medicine strategies
University of Padua, Dept. of Industrial Engineering, Italy	Research Associate	02/2016	04/2018	Engineered strategies for vitro modeling and regeneration of skeletal muscle using murine stem cells and human pluripotent stem cells
University of Padua, Dept. of Women's and Children's Health, Italy	Senior Research Associate (PI)	05/2018	01/2020	Hydrogel 3D bioprinting for in vitro and in vivo applications

Personal Statement

I was trained as medical biotechnologist in 2007 and then in 2011 I concluded my PhD program in Bioscience, curriculum in Genetics and Developmental Biology at the University of Padova (Italy). During my post-doctoral career in Italy and UK (University College of London, UCL) I have had the opportunity to join and experience different research environments, embracing and incorporating into my research line basic biology and animal models, together with stem cell technology and bioengineering approaches. My studies have been mainly focused on the role exerted by the environment and the extracellular matrix (ECM) to control stem cells and skeletal muscle in health and disease. After a first post-doc experience at the University of Padova, which studies were focused on muscular dystrophies associated to collagen VI mutations and skeletal muscle regeneration, I moved in UCL where I specialized in tissue engineering strategies (decellularized muscles) for the development of regenerative medicine strategies. In 2016 I moved back in Italy at the Department of Industrial Engineering of the University of Padova, where I developed a novel 3D bioprinting technology, named intravital 3D bioprinting. In 2018 I won as PI the STARS@ UNIPD grant (intramural grant supporting talented scientists) with the Dept. of Woman's and Children's Health of the University of Padova, and I started my independent career as PI. Since the end of 2020 I'm leading the Neuromuscular Engineering lab at the Pediatric Research Institute "Città della Speranza" (Italy). In 2021 I have been Assistant Professor (non-tenure track) at the Dept. of Molecular Medicine (DMM, University of Padua, Italy) and Honorary Lecturer at the Department of Developmental Biology & Cancer, University College London, UK. In 2024 I have been employed as Assistant Professor (tenure track) at the Dept. of Molecular Medicine (DMM, University of

Padua, Italy), and I'm currently a member of the scientific committee of the Interuniversity Institute of Myology (IIM), member of the Molecular Medicine Department Council and member of the Placement Commission of the University of Padova. I have been member of the Third Commission of the Dept. of Molecular Medicine (UniPD) from 2021 to November 2024, with a profound interest and commitment in public engagement and scientific dissemination.

Contributions to Science

I have published **37** research articles on top international scientific journals in the field of stem cell, skeletal muscle and tissue engineering, holding an **h-index of 20** and **3,465 citations** (Scopus). During my scientific career in Italy and UK I have had the opportunity to join and experience different research environments, incorporating into the research line of my lab basic biology and animal models, together with stem cell technology and bioengineering approaches. I contributed to show the key role the extracellular matrix (ECM) in the homeostasis of skeletal muscle and dystrophies (Grumati et al., Nat Med 2010). My studies were pivotal in sustaining the innovative **vision** that the ECM represent an essential **biological component** of the stem cell niche, driving muscle regeneration and mediating the preservation of skeletal muscle mechanical properties, concepts that at the time was still vastly undervalued by the scientific community (Urciuolo et al., Nat Comm, 2013, Gattazzo*, Urciuolo*# and Bonaldo#, 2014). I open the idea that tissue stiffness can be modified in vivo by the deposition of ECM of transplanted fibroblasts and that such mechanical property can influence muscle stem cell stemness (Urciuolo et al., Nat Comm 2013). More recently, I contributed to show that the ECM mechanical properties of tumorigenic in vivo environment links mechanotransduction to mitochondrial fission, and to metabolic redox homeostasis and metastatic chemotherapy resistance (Romani et al., Nat Cell Biol 2022). I reinforced the concept that ECM play a key role in regulating stem cells, demonstrating the essentiality of ECM in naïve human induced pluripotent stem cell (**hiPSC**) identity, thus opening the possibility to culture single naïve hiPSCs in three-dimension (3D) for further differentiation toward primed hiPSC 3D culture, that can be used to derive 3D organoids (Cesare*, Urciuolo*, Cell Stem Cell 2022). I demonstrated that **decellularized skeletal muscle** allows skeletal muscle regeneration in volumetric muscle loss animal models, as well as sustains **myogenesis** in complex **3D in vitro models** (Urciuolo et al., Scientific Reports 2018; Urciuolo and De Coppi, Int J Mol Sci 2018; Urbani et al. Nat Comm 2018; one patent). I recently contributed to the understanding that dynamic cultures influence matrix remodeling and fibroblast overgrowth in a complex 3D diaphragmatic model that used decellularized muscles (Maghin et al., NPJ Regen Med 2022). I demonstrated the efficacy of extracellular confinement to engineer a 3D in vitro model of human skeletal muscle at the single fiber scale starting from hPSCs (Urciuolo et al., PlosOne 2020), and I contributed to increase knowledge in **reprograming** and **differentiation** of hiPSCs (Gagliano et al, Nat Prot 2019; Selmin et al., Bioch Biophys Res Comm 2021; Yang et al., Front Bioeng Biotech 2022). I was pioneer in demonstrating that 2-photon-mediated fabrication of hydrogels could be used for biological applications (Brigo*, Urciuolo*, et al. Acta Biomater 2017). I developed a breakthrough bioprinting approach, **intravital 3D bioprinting** (i3D), that allows to perform 3D confined and guided stem cell delivery across and within skeletal muscle in live animals without surgical implantation (Urciuolo et al., Nat Biom Eng 2020; and one patent). We also applied this strategy in vivo to study mechanical forces during embryogenesis (Maniou et al., Nat Mat 2024), or in vitro for structural guidance and dynamic control of evolving **organoid** cultures, as I demonstrated by performing hydrogel-in-hydrogel live bioprinting (Urciuolo*# et al., Nat Comm 2023). More recently my interdisciplinary research demonstrated how **tissue engineered human neuromuscular organoids and assembloids** derived by combining human induced pluripotent stem cells and decellularized muscles can be used to mimic and study pathological conditions in vitro, such as Duchenne Muscular Dystrophy, neuromuscular system degeneration and regeneration (Auletta et al., Comms Biology 2025; Rossi et al., Adv Health Material) and cancer-induced muscle cachexia (Chiolerio et al., accepted in principle; Pezzini et al., under revision).

Current research Grants:

2025-2028. Engineering human neuromuscular organoids using the tissue-specific extracellular matrix. Fondo Italiano per la Scienza (FIS), UniPD. *Role:* PI.

2023-2028. Modeling and targeting the mechanisms underlying cancer-cachexia using human neuromuscular system in vitro models. My First AIRC Grant, UniPD. *Role:* PI.

2025 – 2030 Telethon Program Project Joint with Cariparo and VIMM with the project: RNA-based combinatorial multi target therapy for the treatment of inherited neuromuscular diseases." *Role*: Collaborator.