



Università  
di Catania

Uni  
ct

SCIENZE BIOMEDICHE  
E BIOTECNOLOGICHE

**BIOMETEC**  
a research for life

2023



# Section of Biology and Genetics

## Faculty members



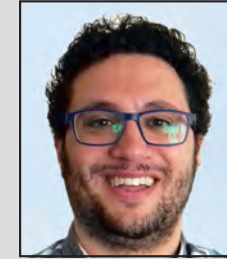
**Vito DE PINTO**  
Full Professor



**Cinzia DI PIETRO**  
Full Professor



**Francesca GUARINO**  
Associate Professor



**Nunzio IRACI**  
Associate Professor



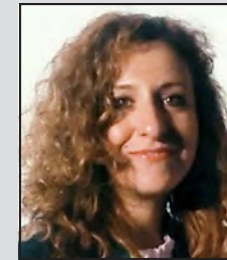
**Giuseppe NICOSIA**  
Associate Professor



**Marco RAGUSA**  
Associate Professor



**Davide BARBAGALLO**  
Assistant Professor



**Rosalia BATTAGLIA**  
Assistant Professor



**SIMONA REINA**  
Assistant Professor

# Section of Biology and Genetics

## Biology, Genomics and Bioinformatics Unit (BGB)

### Cinzia Di Pietro

- Biological and molecular bases of female reproductive aging.
- Biological and molecular function of non coding RNA in human ovarian follicles and in preimplantation embryo.
- MicroRNAs as early biomarkers of testicular tumors.
- Development of nanosensors to improve biopsy liquid specificity.

### Marco Ragusa

- Biological and molecular functions of non-coding RNAs (e.g., miRNAs, lncRNAs, circRNAs) in cellular and extracellular environments in in vitro and ex-vivo models of cancers and neurodegenerative diseases.
- Application of in vitro and in silico approaches to study RNA-RNA network

### Davide Barbagallo

- Biological and molecular functions of non-coding RNAs (ncRNAs) in Glioblastoma (GBM) through in vitro and ex-vivo models.
- ncRNA-mediated regulatory molecular networks: experimental validation and in silico prediction
- Identification of early cancer diagnostic and prognostic biomarkers through minimally invasive approaches

### Rosalia Battaglia

- Biological and molecular functions of non-coding RNAs in oocyte maturation and embryo implantation, signaling mechanisms in the extracellular environment as cargo of extracellular vesicles, and role in the development of reproductive disorders, such as female reproductive aging.

## Molecular Biology, Biotechnology and Synthetic Biology Unit (MB1)

### Vito De Pinto

- VDAC1 as pharmacological target in cancer and neurodegeneration
- Functional roles of VDAC1 in physiological conditions
- Structure and electrophysiological features of human VDAC1

### Francesca Guarino

- Molecular analysis of gene and regulative regions of VDAC isoforms
- Gene expression and regulation of VDAC isoforms in normal and stress condition associated to degenerative disorders
- Characterization of cellular and molecular mechanisms by microfluidics devices utilization

### Simona Reina

- Molecular analysis of post-translation modifications of membrane proteins
- Redox modifications of VDAC isoforms: physiological meaning
- Bioenergetics and redox impact of natural compounds on living cells

## Molecular Biology and Cellular Biology Unit (MB2)

### Nunzio Iraci

- Parkinson's disease and molecular mechanisms of CNS protection and repair
- Cell-to-cell communication via extracellular vesicles, including exosomes
- Horizontal RNA transfer (coding and non-coding)



# Section of Biology and Genetics

## Bioengineering and Synthetic Biology Unit (BSB)

### Giuseppe Nicosia

- Bioengineering: re-engineering cells and biological circuits as programmable devices
- Biomedical engineering: artificial intelligence and machine learning for medicine
- Synthetic Biology: design of integrated biological systems capable of autonomously performing useful tasks
- Systems Biology: programming of selected cells and organelles



**we.MitoBiotech** srl is an innovative Spin-Off of the University of Catania led by researchers of the Section of Biology and Genetics.

**we.MitoBiotech** srl is dedicated to the research and development of new molecules able to counteract mitochondrial dysfunction in neurodegenerative diseases such as Alzheimer's disease, Parkinson's disease and Amyotrophic Lateral Sclerosis (ALS).

Established in 2020, we.MitoBiotech provides companies operating in the pharmaceutical, nutraceutical and cosmetic industries with its expertise in high-resolution investigative techniques to test the effect of specific molecules on mitochondrial function under physiological and/or pathological conditions.

The business idea behind the start-up was selected and won the Start Cup 2019 of the University of Catania. The Start-Up develops the international patent obtained by the team on 'Pharmacologically active peptide compound, process for the preparation and use therefore': 2021 US Patent No. 10,800,81.

# Section of Biology and Genetics



## AWARDED GRANTS / ACHIEVEMENTS OF JUNIOR RESEARCHERS

### Biology, Genomics and Bioinformatics Unit (BGB)

PON-Hyppocrates 2012

I.R.C.C.S. Associazione Oasi Maria SS. ONLUS – Troina

Grant for Fertility Innovation (GFI) 2018 by Merck KGaA, Darmstadt, Germany

H2020 project – Marie Skłodowska Curie Research and Innovation Staff Exchange (RISE) through diaRNAgnosis consortium

PNRR progetto di ricerca dal titolo Health Extended Alliance for Innovative Therapies, Advanced Lab-research, and Integrated Approaches of Precision, tematica n. 6

### Molecular Biology, Biotechnology and Synthetic Biology Unit (MB1)

National Recovery and Resilience Plan (NRRP - Next Generation EU 2022) National Center for RNA drugs – Spoke 2 , Cancer

National Recovery and Resilience Plan (NRRP - Next Generation EU 2022) “Microfluidic-based devices for the comprehensive management and analysis of liquid biopsies”- SAMOTHRACE

PRIN 2010-2013, PRIN 2015, CHANCE, FIR ARISLA 2015

Post-Doctoral Fellowship Fondazione Umberto Veronesi

### Molecular Biology and Cellular Biology Unit (MB2)

“Brains2South” grant (Fondazione con il Sud - Bando Capitale Umano ad Alta Qualificazione 2015)

“National Recovery and Resilience Plan” (NRRP - Next Generation EU 2022)

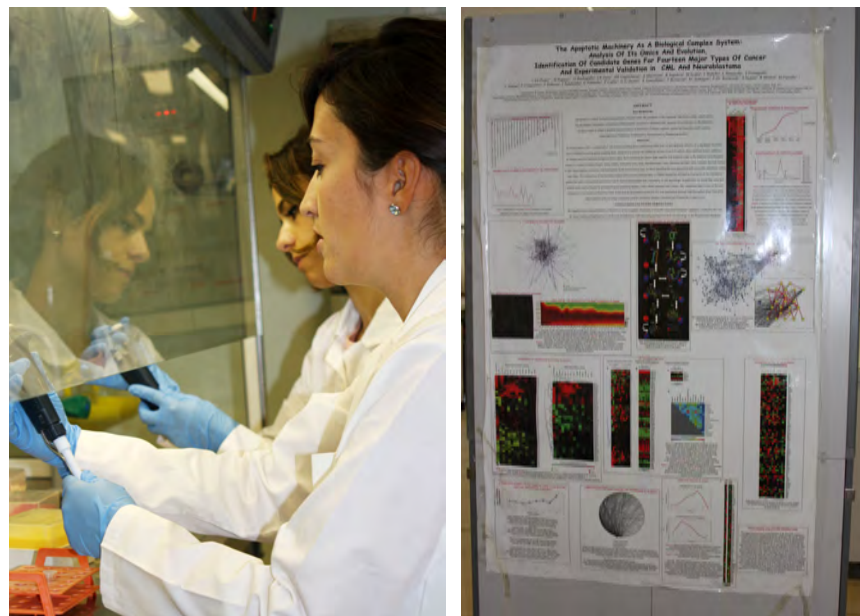
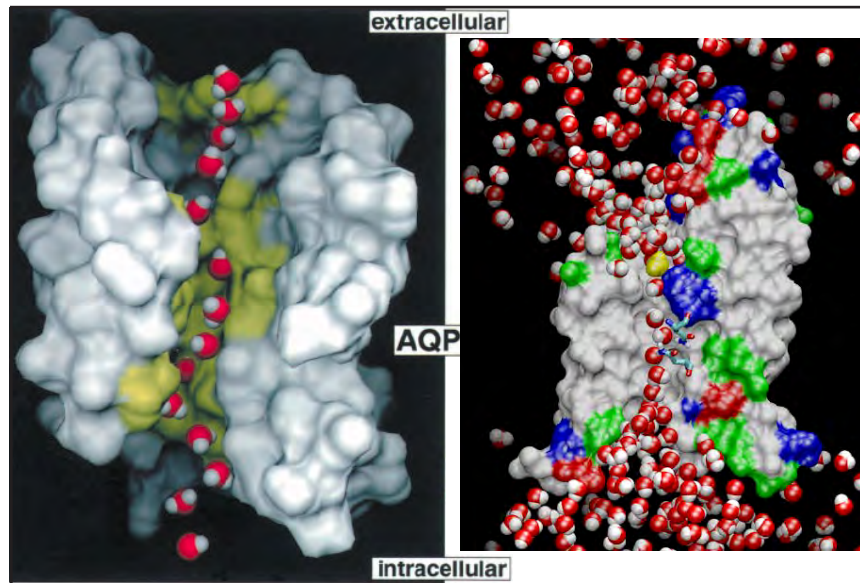


[www.fir2014.unict.it/](http://www.fir2014.unict.it/)  
UNIVERSITÀ DI CATANIA





# Section of Biology and Genetics



## INTERNATIONAL COLLABORATIONS

### Biology, Genomics and Bioinformatics Unit (BGB)

- Antonio Belli (University of Birmingham, Great Britain)
- Valentina Di Pietro (University of Birmingham, Great Britain)
- Thomas Birkballe Hansen (University of Aarhus, Denmark)
- Jorge Hoheisel (German Cancer Research Center, Germany)
- Hadi Valadi (University of Gothenburg, Sweden)

### Molecular Biology, Biotechnology and Synthetic Biology Unit (MB1)

- Ildiko Szabo (University of Padova, Italy)
- Mathias Winterhalter (Biotechnologie, Jacobs Universität Bremen, Germany)
- R. Mahalakshmi (Indian Institute of Science Education and Research, Bhopal, India)
- Varda Shoshan-Barmatz (Ben Gurion Univ. & Negev Institute of Technology, Beer Sheva, Israel)

### Molecular Biology and Cellular Biology Unit (MB2)

- Stefano Pluchino (University of Cambridge, UK)
- Nuno Faria (University of Cambridge, UK)
- Anton Enright (University of Cambridge, UK)
- Jose Manuel Garcia Verdugo (University of Valencia, Spain)

### Bioengineering and Synthetic Biology Unit (BSB)

- Steve Oliver (University of Cambridge, UK)
- Rodrigo Ledesma Amaro (Imperial College London, UK)
- Renato Umeton (Dana-Farber Cancer Institute, USA)
- Luca Zammataro (Yale University, USA)

# Section of Biology and Genetics

## Research paper selection of Biometec (2020-2023)

### Identification of extracellular vesicles and characterization of miRNA expression profiles in human blastocoel fluid.

**Battaglia R**, Palini S, Vento ME, La Ferlita A, Lo Faro MJ, Caroppo E, Borzi P, Falzone L, **Barbagallo D**, **Ragusa M**, Scalia M, D'Amato G, Scollo P, Musumeci P, Purrello M, Gravotta E, **Di Pietro C**. *Sci Rep*. 2019 Jan 14;9(1):84. doi: 10.1038/s41598-018-36452-7.

### Ovarian aging increases small extracellular vesicle CD81+ release in human follicular fluid and influences miRNA profiles.

**Battaglia R**, Musumeci P, **Ragusa M**, **Barbagallo D**, Scalia M, Zimbone M, Lo Faro JM, Borzi P, Scollo P, Purrello M, Vento EM, **Di Pietro C**. *Aging (Albany NY)*. 2020 Jun 17;12(12):12324-12341. doi: 10.18632/aging.103441

### Deletion of Voltage-Dependent Anion Channel 1 knocks mitochondria down triggering metabolic rewiring in yeast.

Magri A, Di Rosa MC, Orlandi I, **Guarino F**, **Reina S**, Guarnaccia M, Morello G, Spampinato A, Cavallaro S, Messina A, Vai M, **De Pinto V**. - *Cell Mol Life Sci*. 2020 Aug;77(16):3195-3213. doi:10.1007/s00018-019-03342-8.

### LncRNA LINC00518 Acts as an Oncogene in Uveal Melanoma by Regulating an RNA-Based Network.

Barbagallo C, Caltabiano R, Broggi G, Russo A, Puzzo L, Avitabile T, Longo A, Reibaldi M, **Barbagallo D**, **Di Pietro C**, Purrello M, **Ragusa M**. *Cancers (Basel)*. 2020 Dec 21;12(12):3867. doi: 10.3390/cancers12123867.

### LINC00483 Has a Potential Tumor-Suppressor Role in Colorectal Cancer Through Multiple Molecular Axes.

Brex D, Barbagallo C, Mirabella F, Caponnetto A, **Battaglia R**, **Barbagallo D**, Caltabiano R, Broggi G, Memeo L, **Di Pietro C**, Purrello M, **Ragusa M**. - *Front Oncol*. 2021 Jan 20;10:614455. doi: 10.3389/fonc.2020.614455.

### Renaissance of VDAC: New Insights on a Protein Family at the Interface between Mitochondria and Cytosol.

**De Pinto V**. - *Biomolecules*. 2021 Jan 15;11(1):107. doi: 10.3390/biom11010107.

### Neural stem cells traffic functional mitochondria via extracellular vesicles.

Peruzzotti-Jametti L, Bernstock JD, Willis CM, Manferrari G, Rogall R, Fernandez-Vizarra E, Williamson JC, Braga A, Van den Bosch A, Leonardi T, Krzak G, Kittel Á, Benincá C, Vicario N, Tan S, Bastos C, Bucci I, **Iraci N**, Smith JA, Peacock B, Muller KH, Lehner PJ, Buzas EI, Faria N, Zeviani M, Frezza C, Brisson A, Matheson NJ, Viscomi C, Pluchino S. - *PLoS Biol*. 2021 Apr 7;19(4):e3001166. (PMID: 33826607)

### A Novel Silicon Platform for Selective Isolation, Quantification, and Molecular Analysis of Small Extracellular Vesicles.

Leonardi AA, **Battaglia R**, Morganti D, Lo Faro MJ, Fazio B, De Pascali C, Francioso L, Palazzo G, Mallardi A, Purrello M, Priolo F, Musumeci P, **Di Pietro C**, Irrera A. - *Int J Nanomedicine*. 2021 Sep 28;16:5153-5165. doi: 10.2147/IJN.S310896.

### Cell-free electrophysiology of human VDACs incorporated into nanodiscs: An improved method.

Conti Nibali S., Di Rosa MC, Rauh O. , Thiel G., **Reina S. , De Pinto V.**, - *Biophysical Reports*, 2021, 1, Issue 1, 100002, DOI: 10.1016/j.bpr.2021.100002

### Competing endogenous RNA network mediated by circ\_3205 in SARS-CoV-2 infected cells.

**Barbagallo D**, Palermo CI, Barbagallo C, **Battaglia R**, Caponnetto A, Spina V, **Ragusa M**, **Di Pietro C**, Scalia G, Purrello M. - *Cell Mol Life Sci*. 2022 Jan 17;79(2):75. doi: 10.1007/s00018-021-04119-8.

### Resveratrol Treatment Induces Mito-miRNome Modification in Follicular Fluid from Aged Women with a Poor Prognosis for In Vitro Fertilization Cycles.

**Battaglia R**, Caponnetto A, Caringella AM, Cortone A, Ferrara C, Smirni S, Iannitti R, Purrello M, D'Amato G, Fioretti B, **Di Pietro C**. - *Antioxidants (Basel)*. 2022 May 21;11(5):1019. doi: 10.3390/antiox11051019.

### Voltage Dependent Anion Channel 3 (VDAC3) protects mitochondria from oxidative stress.

**Reina S**, Nibali SC, Tomasello MF, Magri A, Messina A, **De Pinto V**. - *Redox Biol*. 2022, 51:102264. doi: 10.1016/j.redox.2022.102264.

### Pareto optimal metabolic engineering for the growth-coupled overproduction of sustainable chemicals. Biotechnology

Amaradio MN, Ojha V, Jansen G, Gulisano M, Costanza J, **Nicosia G.**, - *Biotechnology and Bioengineering* 2022 Jul. 119(7):1890-1902. doi: 10.1002/bit.28103

### Small Extracellular Vesicles Secreted by Region-specific Astrocytes Rescue Cell Death and Preserve Mitochondrial Function in Parkinson's Disease.

Leggio L, L'Episcopo F, Magri A, Ulloa-Navas MJ, Paternò G, Vivarelli S, Bastos CAP, Tirolo C, Testa N, Caniglia S, Risiglione P, Pappalardo F, Faria N, Peruzzotti-Jametti L, Pluchino S, Garcia-Verdugo JM, Messina A, Marchetti B, **Iraci N**. - *Adv Health Mater*. 2022 Oct;11(20):e2201203. (PMID: 35856921)

### circSMARCA5 is an Upstream Regulator of the Expression of miR-126-3p, miR-515-5p, and Their mRNA Targets, Insulin-like Growth Factor Binding Protein 2 (IGFBP2) and NRAS Proto-Oncogene, GTPase (NRAS) in Glioblastoma.

Merulla AE, Stella M, Barbagallo C, **Battaglia R**, Caponnetto A, Broggi G, Altieri R, Certo F, Caltabiano R, **Ragusa M**, Barbagallo GMV, **Di Pietro C**, Purrello M, **Barbagallo D**. - *Int J Mol Sci*. 2022 Nov 8;23(22):13676. doi: 10.3390/ijms232213676.

### Cell counting and velocity algorithms for hydrodynamic study of unsteady biological flows in micro-channels.

Torrisi F, Stella G, **Guarino F**, Bucolo M. - *Biomicrofluidics*. 2023 Jan 23;17(1):014105. doi: 10.1063/5.0138587.

### ERK1/2-dependent TSPO overactivation associates with the loss of mitophagy and mitochondrial respiration in ALS.

Magri A, Lipari CLR, Risiglione P, Zimbone S, **Guarino F**, Caccamo A, Messina A. - *Cell Death Dis*. 2023 Feb 15;14(2):122. doi: 10.1038/s41419-023-05643-0.

### L-lactate production in engineered Saccharomyces cerevisiae using a multistage multiobjective automated design framework.

Amaradio MN, Jansen G, Costanza J, Patanè A, Branduardi P, Porro D, **Nicosia G.**, - *Biotechnology and Bioengineering*, 2023 Apr 5. doi: 10.1002/bit.28391