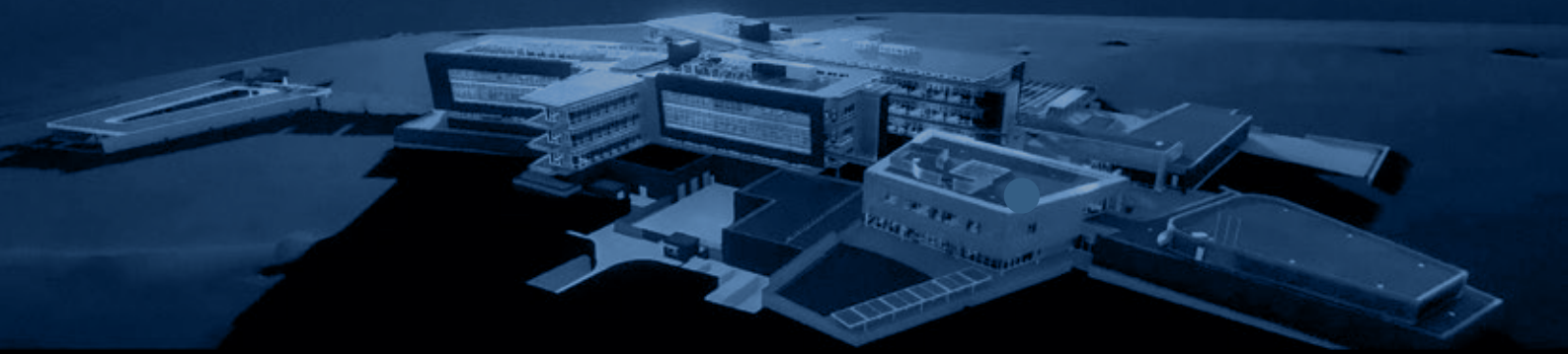
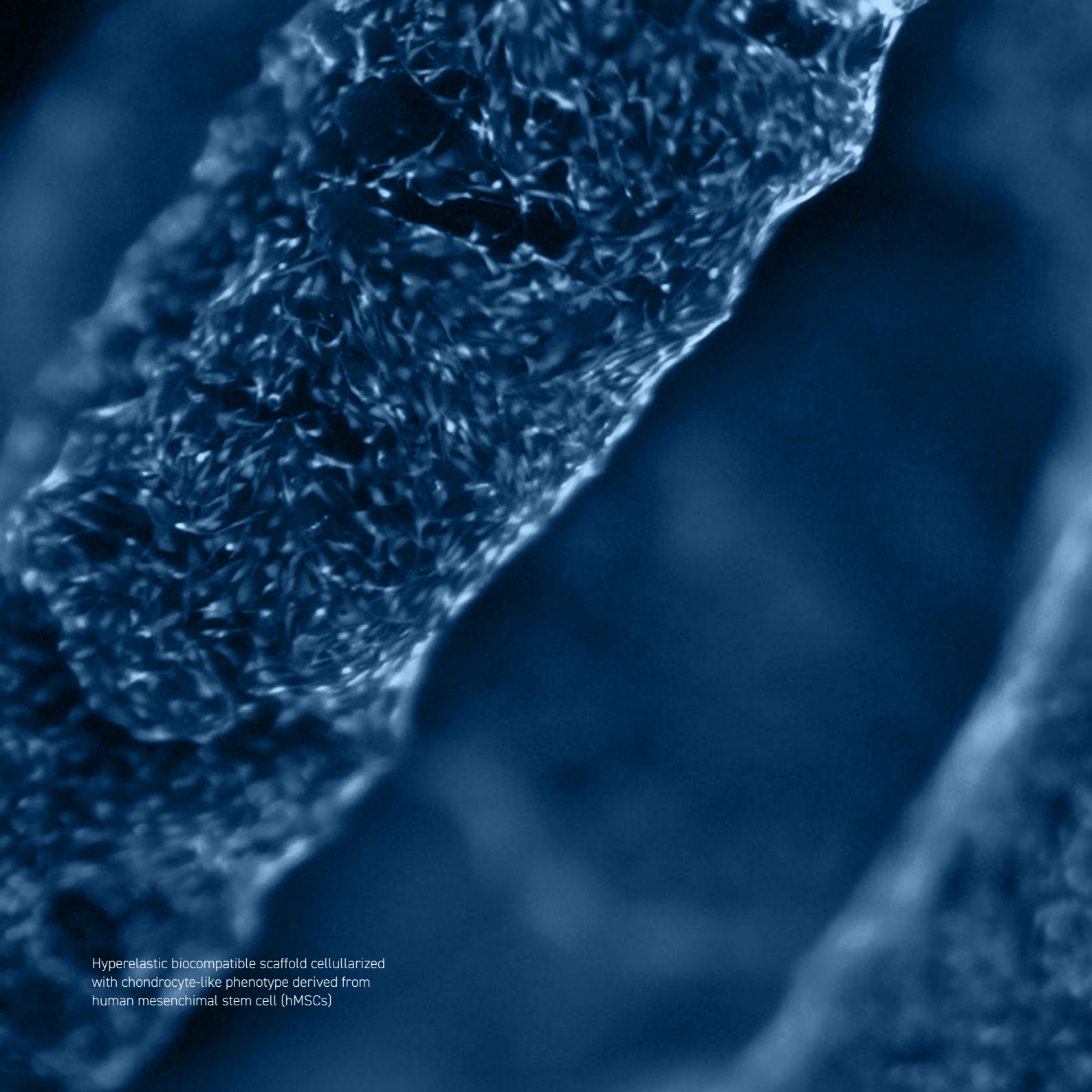
Fondazione
Ri.MED

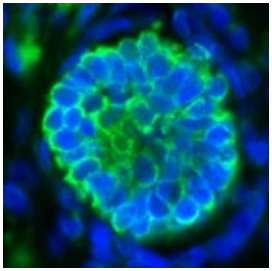
SCIENTIFIC RESEARCH IN THE MEDITERRANEAN

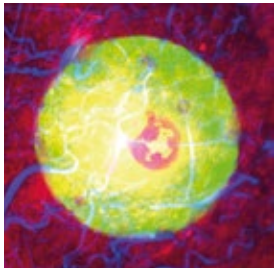


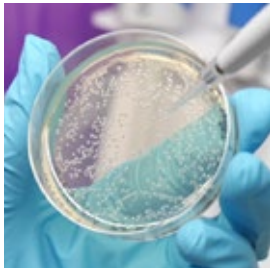


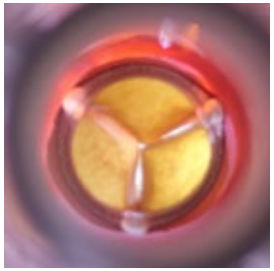
Hyperelastic biocompatible scaffold cellullarized with chondrocyte-like phenotype derived from human mesenchimal stem cell (hMSCs)

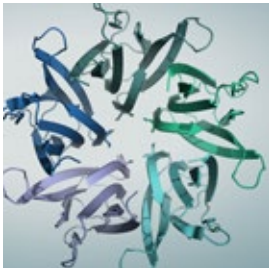
Fondazione Ri.MED











HISTORY

In 2005, the Italian Government signed a memorandum of understanding with the University of Pittsburgh and UPMC (University of Pittsburgh Medical Center) for the realization in Sicily of a biotechnology research and biomedical center of excellence for projects of high technological content. **Research, new technologies, transfer and dissemination of innovation** were, and still are, the focus of the government's **development policies**, in line with the Lisbon Strategy, as priorities to make Italy, and particularly Southern Italy, more competitive.

At the time, UPMC already had a solid international reputation in research and hospital management that had led to the establishment in Palermo (Sicily) of IRCCS ISMETT, one of the major organ transplant and high-specialty therapy centers in Europe.

Sicily was indeed the ideal location to maximize the impact in the Mediterranean area of a biotechnology research and biomedical center. In 2006, with a decree of the Presidency of the Italian Council of Ministers, the Ri.MED Foundation was established as an international partnership between Italian Government, Region of Sicily, Italian National Research Council (CNR), University of Pittsburgh, and UPMC.

In 2017, the Ri.MED Foundation entered the governance of IRCCS ISMETT. As a result, a new cluster was created that integrated translational research and highly specialized care with the goal **to rapidly transfer scientific results "from bench to bedside", to the benefit of patients and of the economic development of Southern Italy and of the entire Italian territory.**

INSTITUTIONAL PARTNERS

Presidenza del Consiglio dei Ministri

ITALIAN GOVERNMENT

The Italian Government has made a considerable investment in the realization of the Foundation's Biomedical Research and Biotechnology Center (BRBC) for research, innovation, biotechnology development, and most of all to improve the quality of life of citizens while fostering an economic growth in Southern Italy.

www.governo.it

Regione Siciliana

REGION OF SICILY

The Region of Sicily recognizes and supports the scientific activity of Ri.MED. In addition to providing the land in Carini, near Palermo, where the BRBC will be built, in 2017 it funded the CheMiST project to establish a computational molecular design and screening laboratory, and contributed to the development of new biomedical technologies under the 2018 Stability Law.

www.regione.sicilia.it

Consiglio Nazionale

CNR (Consiglio Nazionale delle Ricerche)

The most important Italian public research institution, CNR is accountable for carrying out, promoting, spreading, transferring, and improving the progress of science and research, know-how, and applications for scientific, technological, economic, and social progress.

www.cnr.it

UNIVERSITY OF PITTSBURGH

Leader in biomedical research and promoting public health, among the top 10 institutions for NIH funds, the University of Pittsburgh supports Ri.MED's research in the U.S., encouraging joint research programs and attracting private investors to market scientific research products as means for social and economic development.

www.pitt.edu

UPMC (University of Pittsburgh Medical Center)

Operating dozens of university, community, and specialty hospitals across three continents, UPMC is an integrated health system and leader in patient care, biomedicine, telemedicine, and all areas of medicine and research.

www.upmc.com

IRCCS ISMETT (Istituto Mediterraneo per i Trapianti e Terapie ad alta specializzazione)

ISMETT is an organ transplant center and an institute for scientific-based care and research (IRCCS) acknowledged by the Italian Ministry of Health. In 2017, Ri.MED Foundation entered the governance of ISMETT, integrating biomedical research and care in Sicily in a model of a research center merged with a high specialty hospital to "translate" research outcomes, guaranteeing a full synergy between doctors and researchers.

www.ismett.edu

INSTITUTIONAL ROLES

Paolo Aquilanti
President and CEO

Improving patient care and creating new opportunities of growth and economic development for Southern Italy and the entire Mediterranean area.
These are the objectives pursued by the Ri.MED Foundation, strongly supported by the integration with IRCCS ISMETT and with the realization of the Biomedical Research and Biotechnology Center: an integrated center of research and high specialty care destined to become one of the pillars of Italian and European research.

Angelo Luca
Vice President

The goal of the Ri.MED Foundation is to become an international point of reference for research and industrial conversion in the biomedical and biotechnology fields thanks to its prestigious international partners UPMC, University of Pittsburgh, Italian institutions, and the integration with IRCCS ISMETT, a center of excellence for end-stage organ failure and aging, transplants, and high specialization. The Ri.MED-ISMETT cluster will have a positive impact on health, biosafety, skill enhancement, and economic and social development.

Vice President, Health Services, UPMC Italy
Chief Medical and Scientific Officer, UPMC Italy
CEO IRCCS ISMETT, UPMC Palermo, Italy
Associate Professor of Radiology,
University of Pittsburgh

MISSION

The Ri.MED Foundation develops innovative biotechnology and biomedical research aimed at timely transferring scientific discoveries in clinical practice.

The Foundation is engaged in **training** highly qualified staff, **disseminating scientific knowledge, and establishing and managing research centers and laboratories**.

Consistently with its mission, the Ri.MED Foundation has achieved important results, training several biotechnology professionals, publishing hundreds of scientific articles, generating intellectual property covered with filed patents, and promoting local scientific and public engagement events.

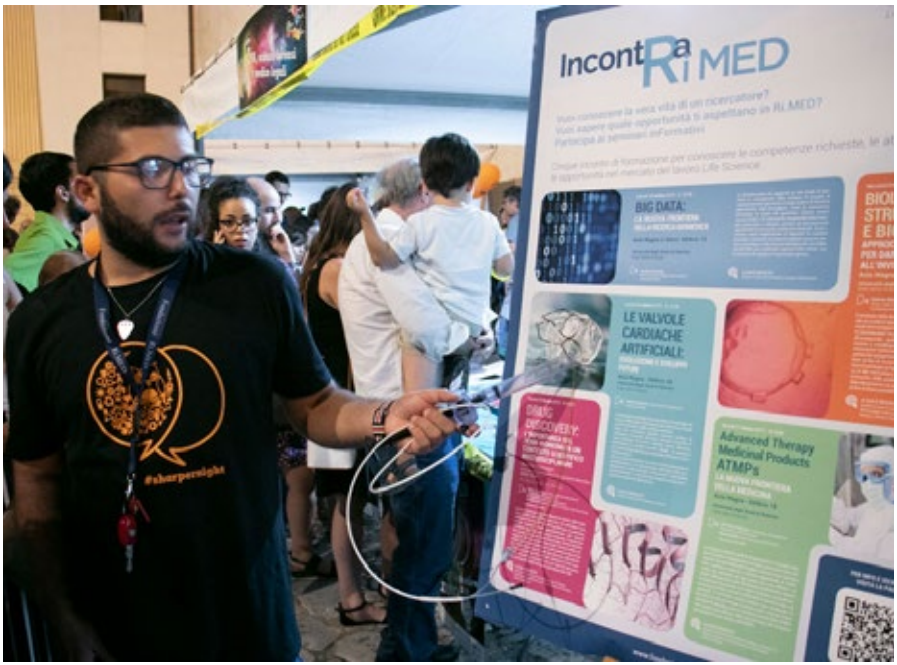
Ri.MED manages laboratories in Sicily and, at the same time, is designing a Biomedical Research and Biotechnology Center ("BRBC") that will be built in Carini, near Palermo, in an area that will also host the new ISMETT hospital.
The result of this strategy will foster innovative solutions for patients, and an increased ability to attract and access new funds.

PUBLIC ENGAGEMENT

Involving and inspiring diverse audiences is one of Ri.MED's priorities. We are currently working on a public engagement program in collaboration with schools and communities designed to inspire and involve people of all ages.

Our presence in the community will facilitate and promote topics and discussions on science and health, investments and employment opportunities, legality and meritocracy.

The size and profile of the BRBC will increase Ri.MED's visibility and scope of action, allowing us to play an important role in generating new enthusiasm and interest in science. To such extent, we are already increasing our presence with educational programs in local schools and various community activities.



EVENTS AND SCIENTIFIC COMMUNICATION

Scientific dissemination and sharing research outcomes are part of the Foundation's mission. This involves developing a wide network of collaborations and scientific agreements with institutions in strategic areas of interest.

In addition to its annual scientific symposium, Ri.MED organizes lectures and workshops in collaboration with its scientific partners attracting researchers from all over the world.

To date, our researchers have published more than 300 articles on peer-review journals with relevant impact factors, contributing to scientific dissemination. Our press office shares the most important discoveries and results with wider audiences.

A TRANSLATIONAL APPROACH

On the major challenges in life sciences today is the ability to rapidly translate the results of scientific research in clinical applications. This requires a special focus on integrating multiple resources and skills, such as basic discovery and preclinical research and development of new therapies, biomedical devices, biomarkers, and clinical trials.

Ri.MED research stems from medical need to develop innovative solutions, and focuses on four main therapeutic areas: **tumors**, with special focus on immunotherapy; **organ failure**, including organ transplantation and regenerative medicine; **infectious diseases**; and **aging-associated diseases**, with a focus on neurodegeneration.

THE IMPORTANCE OF BEING A CLUSTER

In 2017, the Ri.MED Foundation entered the governance of ISMETT alongside partner UPMC. This resulted in a new cluster that integrates translational research and highly specialized care for a rapid "bench-to-bedside" transfer of scientific results to patient care, supporting the economic development of Southern Italy and of the entire country.

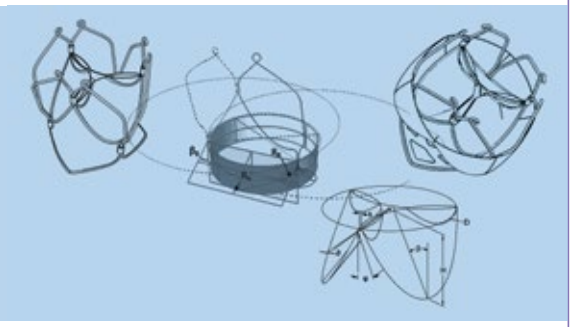
Integrating individual expertise increases the chances of success for translational research projects and, therefore, the possibility to access research funds. Given the mutual objectives and increasing number of joint scientific projects, the strategic collaboration between Ri.MED, ISMETT and UPMC is becoming increasingly stronger.

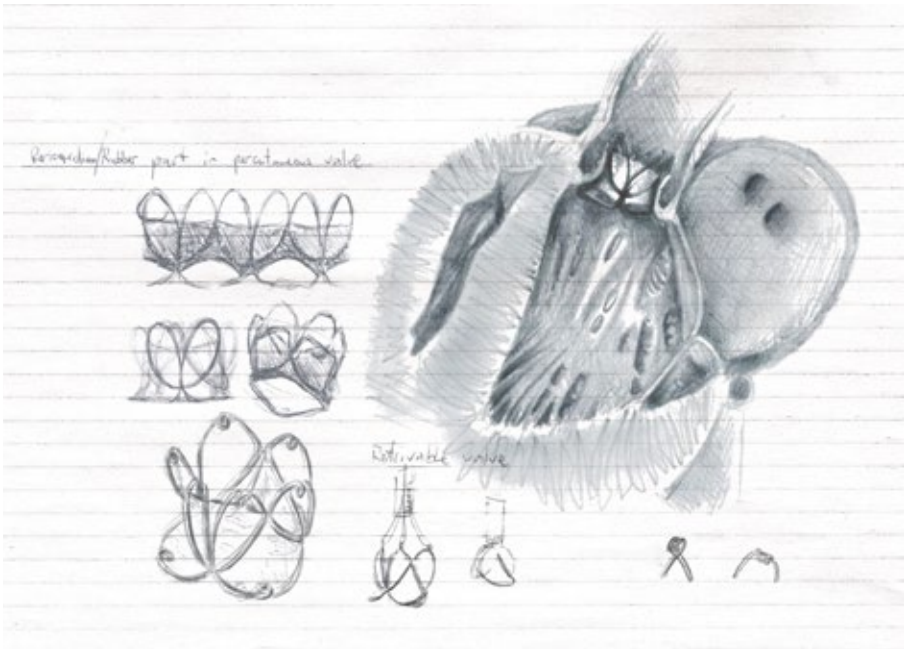
INTELLECTUAL PROPERTY AND TECHNOLOGY TRANSFER

Ensuring scientific results meet clinical needs, requires appropriately managing the intellectual property generated by our researchers and the technology transfer process. **From our laboratories, inventions are translated into patents, then into innovative solutions for patients.**

Protecting intellectual property is a fundamental value for Ri.MED to develop an innovative model of research sustainability through patenting, licensing, industrial sponsorship, and creating technology spin-offs.

The outstanding scientific results and dozens of proprietary or co-owned patents have enabled us to license products and create start-ups.

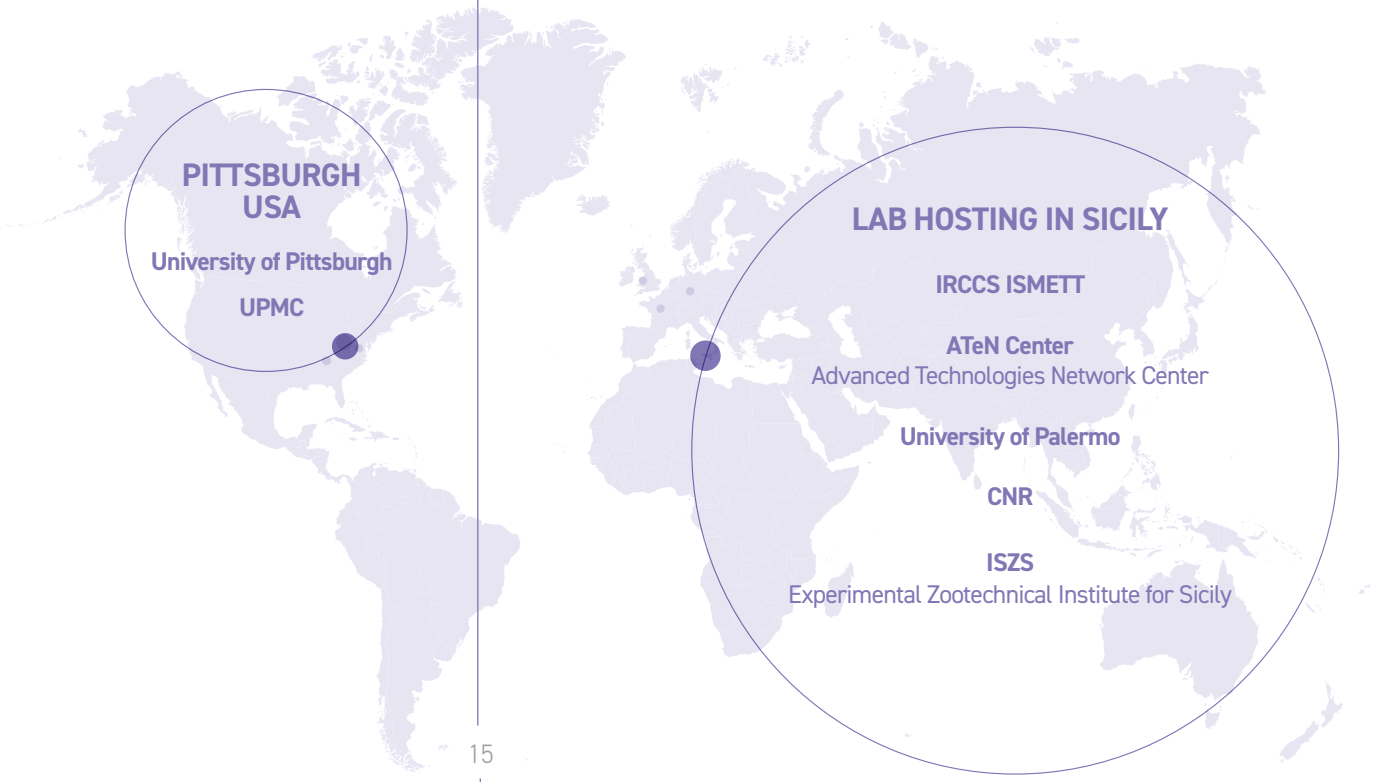




NETWORKING

Several agreements are currently in place to develop technological innovation, promote research, and share lab space and resources with European and American institutions. Our goal is to integrate skills, increase critical mass, ensure successful joint research projects, and become more competitive to access research funds.

Ri.MED also **directly manages laboratories** with the "lab hosting" formula, including regenerative medicine and immunology labs at IRCCS ISMETT; structural and biophysical biology labs at ATeN Center; tissue engineering, bioengineering, medical chemistry, molecular informatics, advanced data analysis, and biomedical imaging labs at the University of Palermo; and high throughput screening labs at IRIB (CNR).



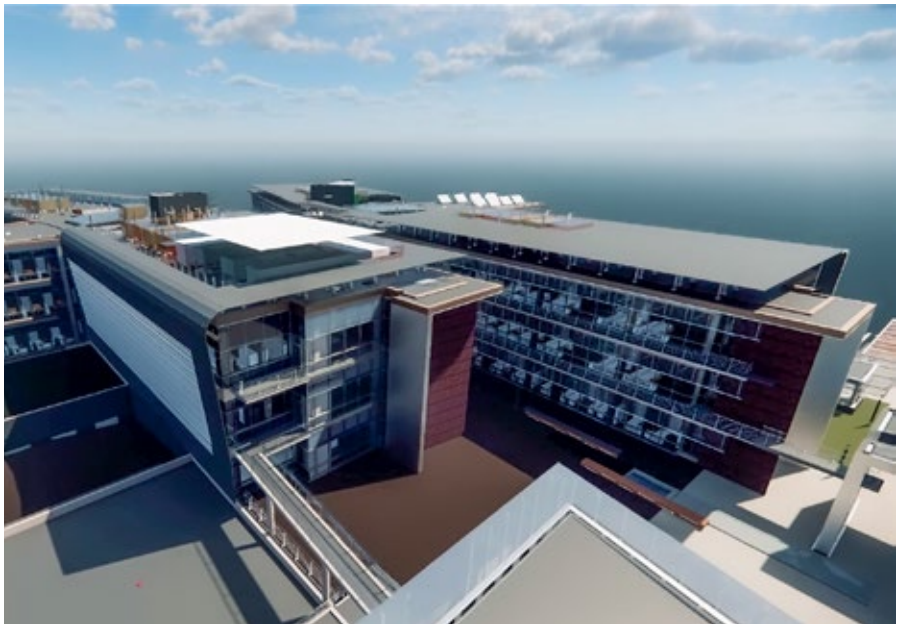
BIOMEDICAL RESEARCH AND BIOTECHNOLOGY CENTER

Ri.MED is building a center for research and development of new vaccines and drugs, cellular therapies, and organ and tissue engineering in Carini, near Palermo.

The construction of the BRBC was awarded to a group of enterprises led by Italiana Costruzioni, whereas a temporary association of companies will direct the works with Progetto CMR (leading firm), part of the group awarded the design contest led by HOK.

The project is based on the "village-road" model characterized by a totally flexible organization of space: 17,000 square meters of laboratories, common spaces, conference rooms, offices, an auditorium, guest houses, connected to the new ISMETT hospital.

The BRBC will create hundreds of jobs and develop allied activities linked to the technological transfer of research products.



A RESEARCH AND CARE HUB

The project for the new ISMETT hospital was designed by architect Renzo Piano in Carini, right next to the BRBC. The integration of research and high specialty care will benefit patients and the economic development of Southern Italy and of entire country.
The discoveries made at the BRBC will be used at ISMETT and in other Sicilian and Italian hospitals, improving advanced diagnostics and therapeutics tools and protocols for patients.

The result will be an economic development policy based on biomedical sciences turning Sicily into an international area of excellence for life sciences, also thanks to the expertise provided by UPMC and the University of Pittsburgh.

RESEARCH GRANTS

The Ri.MED Foundation supports its scientific activity with funds from public and private bodies, and regional, national, and international institutions.

Accessing research funds is a strategic activity for the sustainability of the Foundation. Our Grants Office selects financial programs supporting biomedical research, training and dissemination of scientific knowledge, and manages relations with funding institutions.

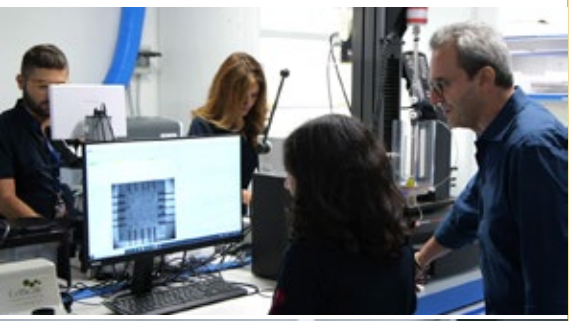
The Foundation's success obtaining research funds confirms the level of innovation and international expertise accomplished by our researchers.

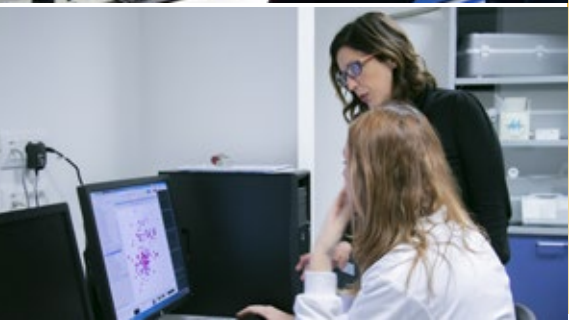
TRAINING AND EMPLOYMENT

Training highly qualified personnel is not only part of Ri.MED's mission, but a task the Foundation carries out with particular enthusiasm, understanding that offering high-level training can contribute to enriching the future of young people, and the competitiveness and development of Sicily.

Since its establishment, Ri.MED has invested in training, sponsoring numerous post doc **fellowships** at the University of Pittsburgh, and awarding dozens of fellowships for **innovative on-the-job training and industrial Ph.D. programs**, also thanks to funding accessed on European, ministerial, and regional calls.

The Foundation activates curricular and extra-curricular training programs for students and graduates in collaboration with Italian and European universities. **Employment opportunities** are constantly increasing and will continue to grow in view of the opening the BRBC.





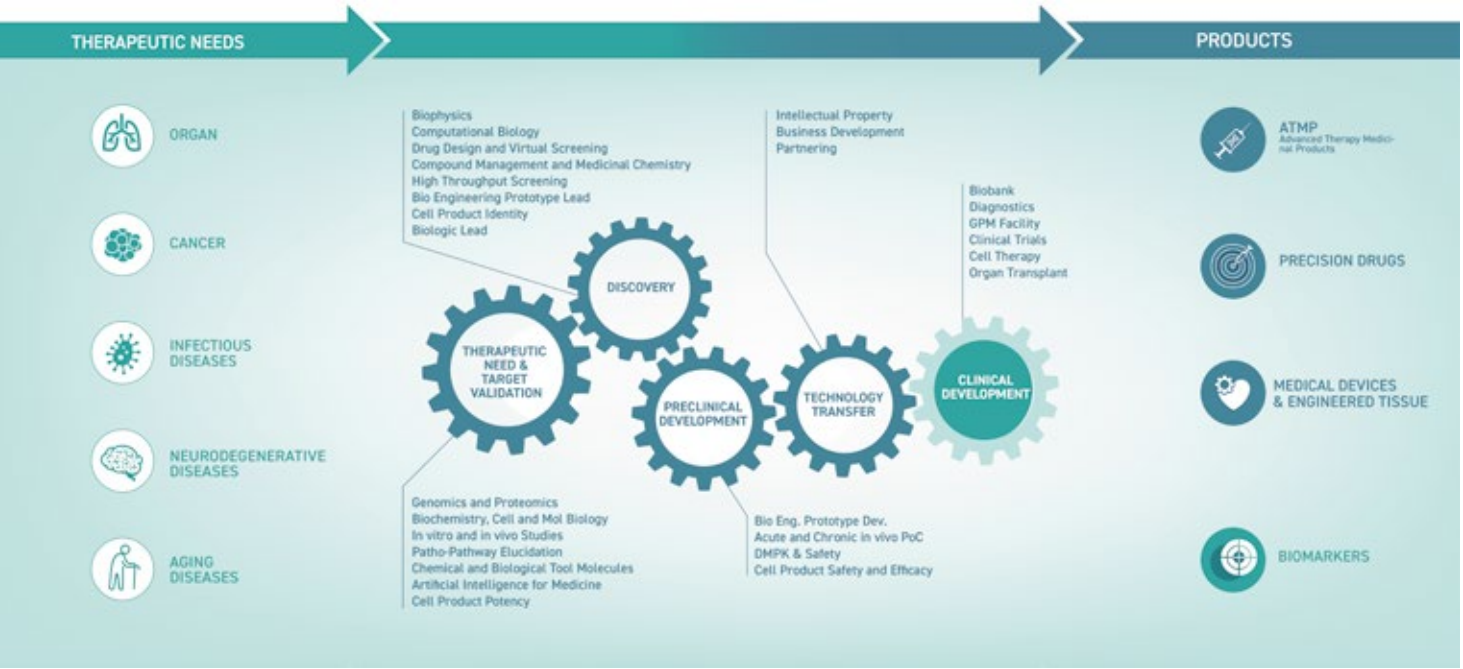
PORTFOLIO

Ri.MED's translational research approach is based on therapeutic needs and developed on multiple levels, including the collaboration with our partners: from basic research and pre-clinical research and development, to clinical trials conducted with IRCCS ISMETT.

Ri.MED has a diversified and balanced project portfolio led by a multidisciplinary team with clear product **development goals and a "bench-to-bedside" approach**.

The translational research engine of Ri.MED Foundation envisages the development of **skills and technology platforms** supporting scientific projects.

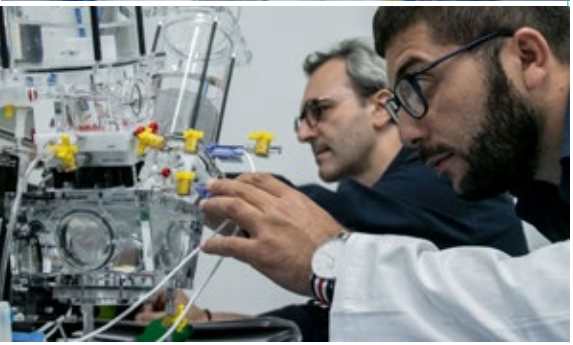
The currently available and constantly expanding technology and skills support Ri.MED's operations, making it a point of reference of high value scientific research for public institutions and private companies.

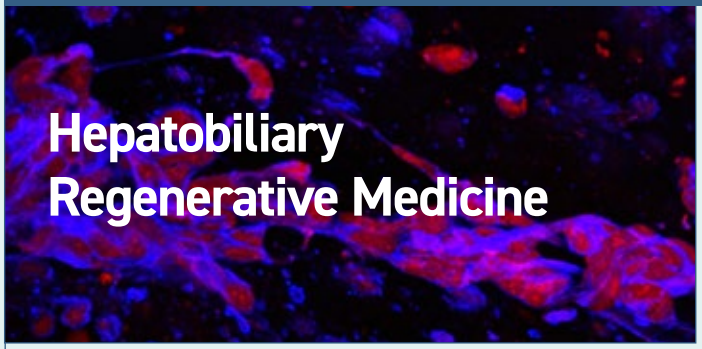


RESEARCH AREAS

Ri.MED's scientific projects are based on three main areas of interest: regenerative medicine and immunotherapy, aimed at developing advanced therapy medicinal products (ATMP); new drug discovery research and development; and tissue engineering and biomedical bioengineering, focused on developing biomaterials, engineered tissues, and medical devices.

The activities range from identifying new biologically active molecules to developing cellular products for tissue repair and/or regeneration, and organotypic cultures for regenerative purposes and as models for pharmacology screening, and all the way to simulation of physiological systems and preclinical validation of new generation implantable organs and devices.





Hepatobiliary Regenerative Medicine

The Hepatobiliary Regenerative Medicine group focuses broadly on regenerative medicine strategies for the treatment of cholangiopathies, a diverse group of diseases targeting the biliary tree.

AIMS

- Advance cell culture techniques for patient-derived biliary epithelial cells (BECs)
- Tune biomaterial properties for improved growth and function of BECs
- Fabricate bile duct-like structures *in vitro*
- Investigate BEC–biomaterial interactions and BEC functions *in vitro*
- Investigate the safety and efficacy of lab-generated bile duct-like structures *in vivo*

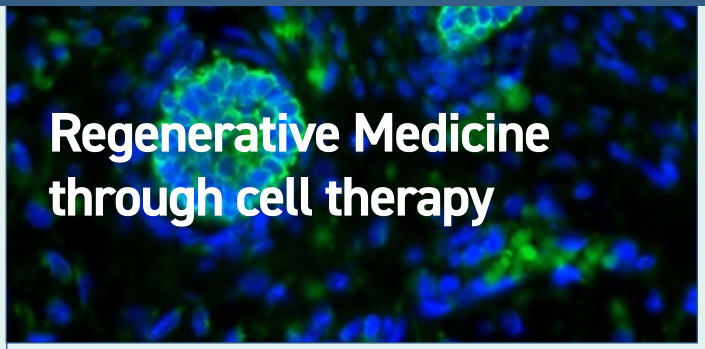
FOCUS

- Establishment of patient-derived BEC cultures
- Development of implantable bioartificial bile ducts
- Development of translational pathways for combined ATMPs in this area

EXPERTISE AND RESOURCES

- Primary adult and progenitor cell isolation/purification, culture, and functional characterization
- Biomaterial processing
- Histology and cell imaging techniques
- Functional and mechanistic studies
- Molecular biology

Ri.MED Lab c/o IRCCS ISMETT, Palermo
Contacts: mgfrancipane@fondazionerimed.com



Regenerative Medicine through cell therapy

The Regenerative Medicine Cell Therapy group is engaged in developing strategies based on cell secreted factors to restore/improve organ function after a damage. The approach relies on the role of cell secretome as a new booster for regenerative medicine, encompassing the extracellular vesicles (EVs), which are considered next generation therapeutics.

AIMS

- Developing treatment options for chronic skin wounds
- Developing treatment options for NAFLD/NASH
- Improving the efficacy of secretome/EV therapeutics by providing scaffold biomaterials

FOCUS

- Identifying the best therapeutic agent by comparing secretome/EVs of different sources
- Creation of master cell banks according to GMP standards
- Manufacturing of secretome/EVs according to GMP standards
- Design and production of secretome/EV-laden biomaterials
- *In vivo* preclinical tests of efficacy and safety

EXPERTISE AND RESOURCES

- Isolation, culturing and banking of human mesenchymal stromal cells (MSCs)
- Collection and characterization of secretome/EVs
- *In vitro* cell-based functional assays
- Immunoassays
- Molecular biology
- Histology and cell imaging
- Tuning biomaterial properties with cell secreted factors

Ri.MED Lab c/o IRCCS ISMETT, Palermo
Contacts: cchinnici@fondazionerimed.com

Experimental immunotherapy

The Immunotherapy group is focused on the development of cell-mediated therapies aiming at increasing the life expectancy of patients in solid organ transplantation and cancer.

AIMS

- Treatment of patients affected by liver cancer with innovative CAR-NK cells engineered to have enhanced specificity to hepatocellular carcinoma
- Early weaning off immunosuppressive therapy of Solid Organ Recipient using Tolerogenic Dendritic Cells
- Development of off-the-shelf cellular products

FOCUS

- Engineering of CAR-NK cells for the treatment of liver cancer
- Increasing the anti-tumoral fuction of NK cells by *ex vivo* activation with specific cytokines
- Understanding the role of dendritic cells in tolerance induction
- Production of Tolerogenic Dendritic Cells
- Preclinical studies and *in vivo* proof-of-concept of safety and ecacy of of cell-mediated therapies
- Development of GMP-compliant protocols for large scale cell production for clinical applications

EXPERTISE AND RESOURCES

- Animal house for the execution of preclinical studies, equipped with a *In vivo* Imaging System (IVIS) Spectrum which allows tracing tumor growth in live lab animals
- Cell factory equipped with instruments for closed-circuit isolation, engineering and expansion of cellular products in compliance with GMP protocols
- Certified personnel for the production and release of clinical-grade cell batches
- Aliation with the Transplantation Institute ISMETT, where clinical trials will be assessed

Ri.MED Lab c/o IRCCS ISMETT, Palermo
Contacts: ebadami@fondazionerimed.com

GMP Cell Factory

The Cell Factory group includes Production, Quality Assurance (QA), Quality Control (QC) staff and a Qualified Person for the release of Advanced Therapy Medical Products (ATMPs) for clinical use.

AIMS

- Contribute to translational medicine, providing new ATMPs to patients
- ATMPs release for Phase I studies and single patient use
- Optimization/automation of production processes

FOCUS

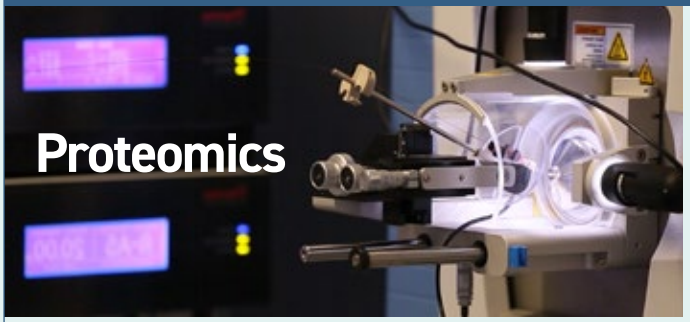
- Cell based therapies for end stage organ failure
- Immunotherapies, e.g. Multivirus specific cytotoxic T lymphocytes

EXPERTISE AND RESOURCES

- Definition and validation of GMP compliant processes and QC tests
- Production of cell therapies and QC tests
- Maintenance of a Good Manufacturing Practice compliant QA system
- Cell product banking
- Fully equipped GMP facility and QC Lab (to be authorized by AIFA)

Ri.MED Lab c/o IRCCS ISMETT, Palermo
Contacts: cdibartolo@fondazionerimed.com

DRUG DISCOVERY



Proteomics

The Proteomics group uses mass spectrometry based proteomics to dissect pathophysiological mechanisms and identify novel therapeutic targets in cancer and inflammatory diseases.

AIMS

- Use unbiased proteomics to better understand pathophysiological processes
- Identify molecular targets and biomarkers to improve healthcare
- Develop new diagnostic and therapeutic approaches to better predict possible side effects of medication
- Support proteomics studies of any size on collaborative basis

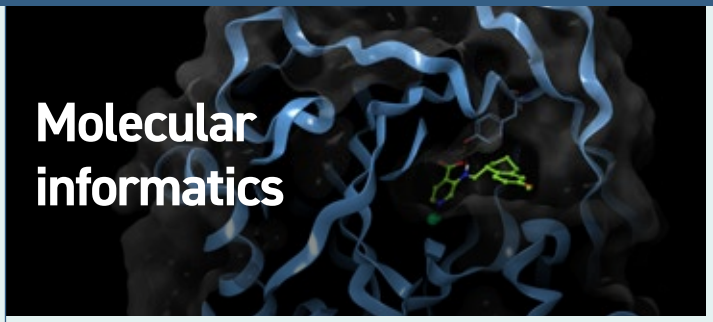
FOCUS

- Investigate ectodomain shedding in health and disease
- Dissect the role of ADAM17 and iRhoms in cancer and inflammatory diseases
- Investigate protein trafficking and secretion by using high-resolution mass spectrometry

EXPERTISE AND RESOURCES

- Mass spectrometry-based analysis of cell secretomes and surfaceomes
- HiSPECS proteomics for unbiased characterization of primary cultures
- Biochemical and proteomic methods to dissect ectodomain shedding and other biological processes
- Skilled researchers with expertise in proteomics, biochemistry and cell biology
- Avant-garde instruments for high-resolution proteomics and fully equipped lab for biochemistry and cell biology

Ri.MED Lab c/o IRCCS ISMETT, Palermo
Contacts: sdscilabra@fondazionerimed.com



Molecular informatics

The Molecular Informatics group exploits innovative computational techniques for the design of new chemical or biological entities and the prediction of their therapeutic properties. Powerful computing tools and state-of-the-art infrastructures also allow to elucidate important molecular interactions underlying different pathologies.

AIMS

- Understanding of molecular mechanisms behind different pathologies
- Design of chemical or biological therapeutic agents
- Creation of predictive models to reduce from-bench-to-bedside process duration

FOCUS

- Creation of molecular libraries for biological screening
- Design of chronic inflammation disease modulators
- Design of anticancer agents
- Study of protein-protein interactions in biological processes
- Computational applications for antibody design

EXPERTISE AND RESOURCES

- Machine Learning models for molecular properties prediction
- Computer-Assisted Molecular Design
- Molecular Dynamics (biased and unbiased)
- CPU and GPU-based virtual screening
- Compound management platform

Ri.MED Lab c/o University of Palermo
Contacts: uperricone@fondazionerimed.com

Advanced Data analysis

The Advanced Data Analysis group integrates different layers of expertise: from Wet Lab to Omics data analysis with focus on biological complex systems.

AIMS

- Provide scientific interpretation of biological big-data
- Develop custom data analysis algorithms for omics data
- Design pipelines to integrate the analysis of multiple sources of data
- Unravel biological interaction networks
- Design RNA-based therapeutics

FOCUS

- The role of DNA repetitive sequences in physiological and pathological conditions
- The molecular aspects of aging and their role in cancer and degenerative diseases
- microRNA, competitive endogenous RNA, long non coding RNA
- Alternative splicing and its modulation

EXPERTISE AND RESOURCES

- Molecular biology, System biology, Statistics, Bioinformatics, Machine Learning
- Long-read Next Generation Sequencing (Oxford Nanopore Technologies)
- Genomics, Epigenomics, Transcriptomics, Metagenomics data analysis
- R, Python, Matlab, Galaxy

Ri.MED Lab c/o University of Palermo
Contacts: ccoronnello@fondazionerimed.com

Medicinal chemistry

Medicinal Chemistry group's focus is the design and synthesis of new small molecules with potential biological activity toward therapeutic targets of interest.

AIMS

- Discovery of new active ingredients
- Diseases therapeutic treatment

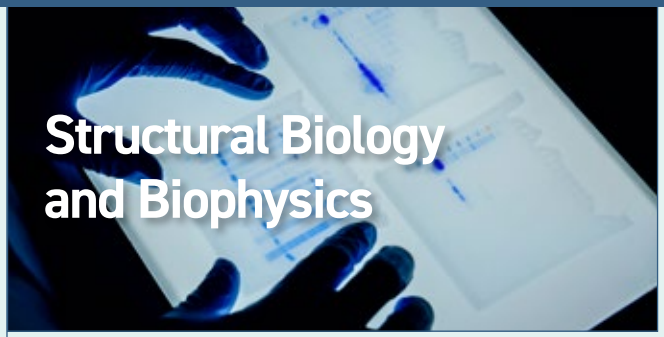
FOCUS

- Discovery of new hit compounds
- Family hit expansion and structure optimization
- Structure-activity relationship exploration
- Hit-to lead optimization

EXPERTISE AND RESOURCES

- Medicinal chemistry and drug discovery
- Peptides, peptidomimetics and small molecules chemistry
- (Microwave-assisted) Organic synthesis
- Planning, development and optimization of synthetic routes
- Structure elucidation
- Purity grade assessment

Ri.MED Lab c/o University of Palermo
Contacts: mderosa@fondazionerimed.com



Structural Biology and Biophysics

The Structural Biology and Biophysics group is engaged in small molecules-based drug discovery, and development of recombinant therapeutic proteins.

AIMS

- Understanding of molecular mechanisms of neurodegenerative and infectious disease
- Develop novel preclinical candidates for unmet medical needs
- Contribute to define next generation therapeutic treatments
- Facilitate the creation and consolidation of local biotech companies
- Contribute to consolidate Structural Biology in South Italy and Mediterranean Area

FOCUS

- Development of precision medicine treatments
- Identification of new therapeutic targets
- Development of therapeutic proteins with particular emphasis on therapeutic antibodies
- Implementation of NMR-based diagnostic tools
- Development of protein-based and RNA-based vaccines

EXPERTISE AND RESOURCES

- Design and production of engineered proteins
- Structural and biophysics characterization of biomolecules
- Kinetic and thermodynamic studies of protein-protein and protein-ligand interactions
- BLI-based and NMR-based fragment screening
- Development of customed analytical assays

Ri.MED Lab c/o ATeN Center, Palermo
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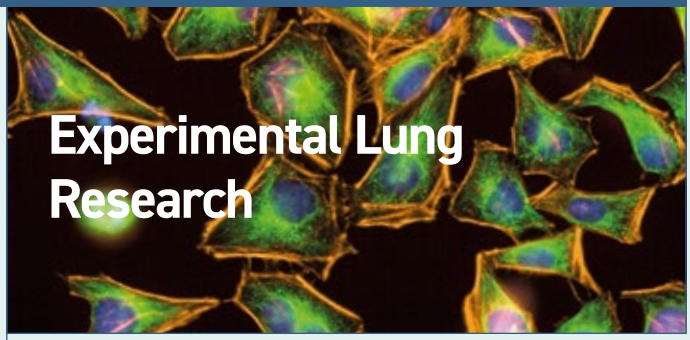

Experimental Lung Research

The Esperimental Lung Research group is focused on studying innate immune responses in chronic lung diseases to identify new therapeutic targets.

AIMS

- Dissect mechanisms promoting chronic lung diseases
- Discover new therapeutic targets
- Develop tools for monitoring disease progression and response to therapy
- Discover new modulators of targets of interest

FOCUS

- Chronic Lung Diseases
- Inflammation
- Drug discovery
- Biosensors

EXPERTISE AND RESOURCES

- Biochemistry, cell and molecular biology
- Advanced 2D and 3D experimental models
- Primary cell isolation and culture
- High content imaging
- Screening platform

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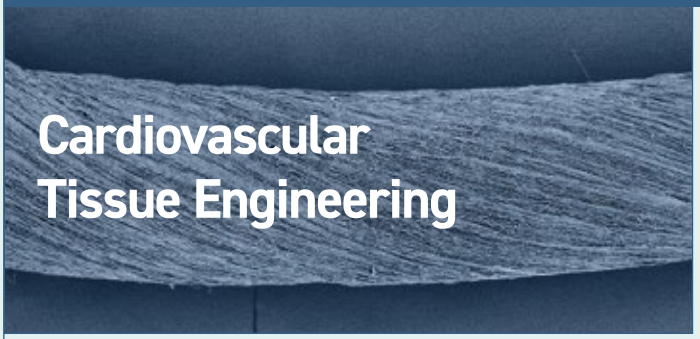
ENGINEERED TISSUE & MEDICAL DEVICES



Cardiovascular Tissue Engineering

The cardiovascular tissue engineering group seeks to couple a mechanistic understanding of the relationship between scaffolds micro-structure, mechanics and endogenous tissue growth with the development of novel biomaterials for cardiovascular tissue engineering strategies.

AIMS

- Structural modeling for cardiovascular tissue engineering
- Biological system models to duplicate native tissue properties
- Development of biomedical devices

FOCUS

- Tissue engineered heart valve
- Tissue engineered vascular graft
- Tissue engineered cardiovascular patch
- Bioreactor for extracellular matrix elaboration
- Native/engineered tissue image based structural and histopathology analysis
- Native/engineered tissue numerical models for mechanics and tissue growth

EXPERTISE AND RESOURCES

- Engineered tissue bio-fabrication
- Biomaterial processing
- Mechanical and physical-chemical characterization of native and engineered tissues
- Qualitative and quantitative histological assessment
- Mechanobiology
- Numerical models applied to tissue growth/degradation and structural image-based analysis
- *In vitro* and *in vivo* characterization of biomaterials

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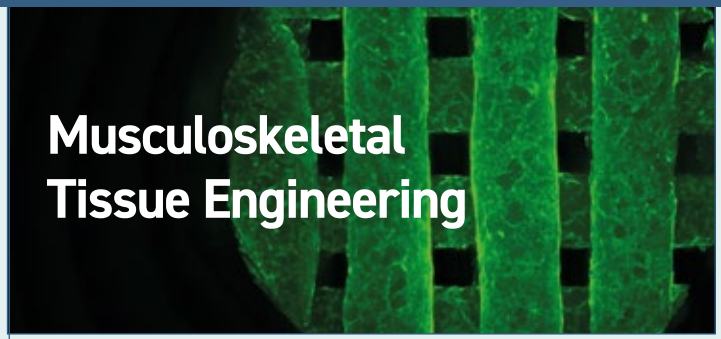

Musculoskeletal Tissue Engineering

The musculoskeletal tissue engineering group aims to study pathologies affecting locomotor apparatus. The scientific approach is based on two diversified macroarea focused either on the development of cell-laden biomaterials promoting tissue regeneration, or on the investigation on new molecular pathways disease-related.

AIMS

- Development of advanced biomaterials promoting tissue regeneration
- *In vitro* disease modeling of musculoskeletal pathologies
- Identification of new therapeutic target and molecular pathways related to musculoskeletal diseases

FOCUS

- Development of smart materials stimuli-responsive
- Optimization of advanced biofabrication techniques based on 3D printing and bioprinting
- Dynamic 3D culturing technologies of native and engineered tissues
- Development of personalized regenerative-rehabilitation regimens
- Advanced imaging on cells and tissues

EXPERTISE AND RESOURCES

- Harvesting and handling of native tissues
- *Ex vivo* culturing of native and engineered tissues
- Primary cells isolation, culturing, and differentiation
- Design of *in vivo*-mimicking studies into bioreactors
- Biofabrication of cellularized scaffold by bioprinting

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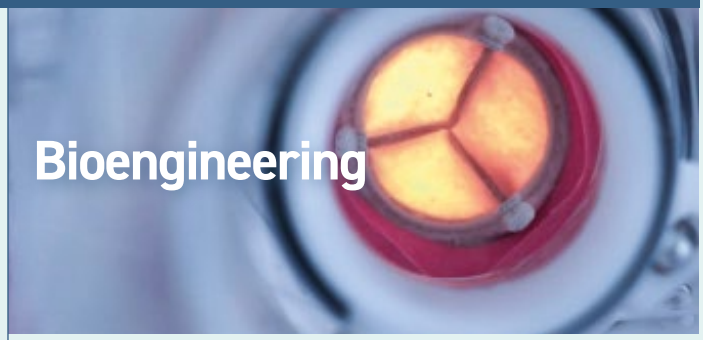
ENGINEERED TISSUE & MEDICAL DEVICES



Bioengineering

The Bioengineering group applies the most advanced engineering approaches to develop innovative therapeutic treatments that make measurable impact to patients' lives.

AIMS

- Contribute to define next generation healthcare treatments
- Assist local clinicians to enhance the offered standard of healthcare
- Stimulate the development of clinical innovation by local excellence
- Facilitate the creation and consolidation of local biomedical enterprises
- Engage in fundamental science to clarify and address disease mechanisms

FOCUS

- Design and assessment of novel, more effective, medical devices
- Development of advanced diagnostic and monitoring solutions
- Implementation of supporting tools for therapeutic planning
- Development of personalised precision-medicine treatments
- Generation of new technical competencies in bioengineering

EXPERTISE AND RESOURCES

- Design and optimisation of medical devices of all classes of risk
- *In vitro* analysis of physiological systems and devices
- Treatment and characterisation of biomaterials and biofluids
- Numerical simulation of complex physiological phenomena
- Prototyping and preclinical assessment of cardiovascular implants

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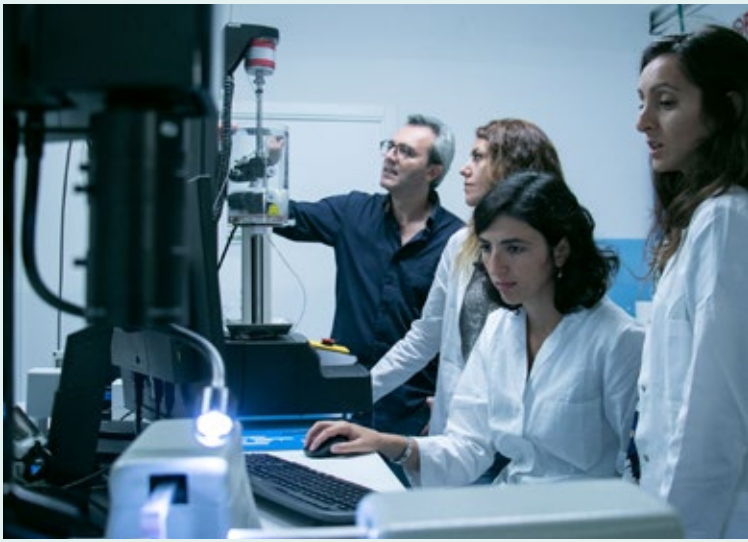

PRECLINICAL RESEARCH

Imaging and Radiomics

The Imaging and Radiomics group integrates different levels of expertise starting from *in vitro* tests with Radiopharmaceuticals to Artificial Intelligence and Radiomics analysis of Preclinical and Clinical Imaging.

AIMS

- Develop Artificial Intelligence systems to support Biomedical decision-making
- Develop tools for target Detection, Segmentation and Classification in biomedical Imaging
- Develop Radiomics tools for Preclinical Biodistribution analysis of Radiopharmaceuticals
- *In vitro* Quantification of Radioactive compounds

FOCUS

- Artificial Intelligence in Precision Medicine
- Radiomics for the quantitative evaluation of the Efficacy of treatments
- *In vitro* and *In vivo* Theranostic studies: New Radiopharmaceuticals for Diagnosis and Therapy
- Radiobiology Studies for Dosimetry-Time Effectiveness of Radiopharmaceutical Therapy

EXPERTISE AND RESOURCES

- Imaging, Radiomics, Artificial Intelligence, Deep Learning, Machine Learning
- Biodistribution analysis of Radiopharmaceuticals: Preclinical Molecular Imaging
- *In Vitro* and *In Vivo* Radiobiology: Radiopharmaceuticals and Radio-labeled Chelators
- PET/CT, MRI, HRCT, IVIS, Gamma Counter
- Python, Matlab, CUDA

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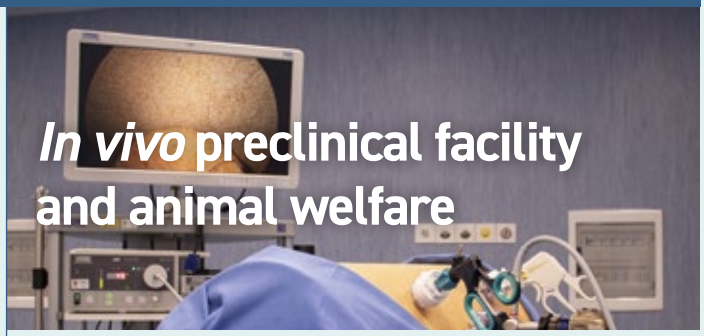

In vivo preclinical facility and animal welfare

The *in vivo* Preclinical Research group provides support to researchers for the development of small-sized (rodents and lagomorphs) and large-sized (pigs and sheep) pathological models, is made up of a Veterinarian Expert in Laboratory Animals and an Animal Care.

AIMS

- Welfare of Laboratory Animals
- Standardization of animal models
- 3R Application (Reduction, Replacement and Refinement) also through the use of *in vivo* imaging

FOCUS

- Test surgical, pharmacological, metabolic, gene and immunological therapies on animal models that mimic terminal organ failure
- *In vivo* Proof-of-concept
- Training for doctors and veterinarians

EXPERTISE AND RESOURCES

- Support to researchers for Health Ministerial authorization, Legislative Decree 26/14 (projects, training)
- Relationship with Institutions involved in *in vivo* preclinical research
- Health control and drafting of policies that allow the maintenance of humanazed strains
- Staff training
- Animal cells, tissues and organs banking for *ex vivo* research

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