



Empowering
Emilia-Romagna
Biotech

EMILIA-ROMAGNA BIOHUBS NETWORK

Empowering the regional biotechnologies ecosystem

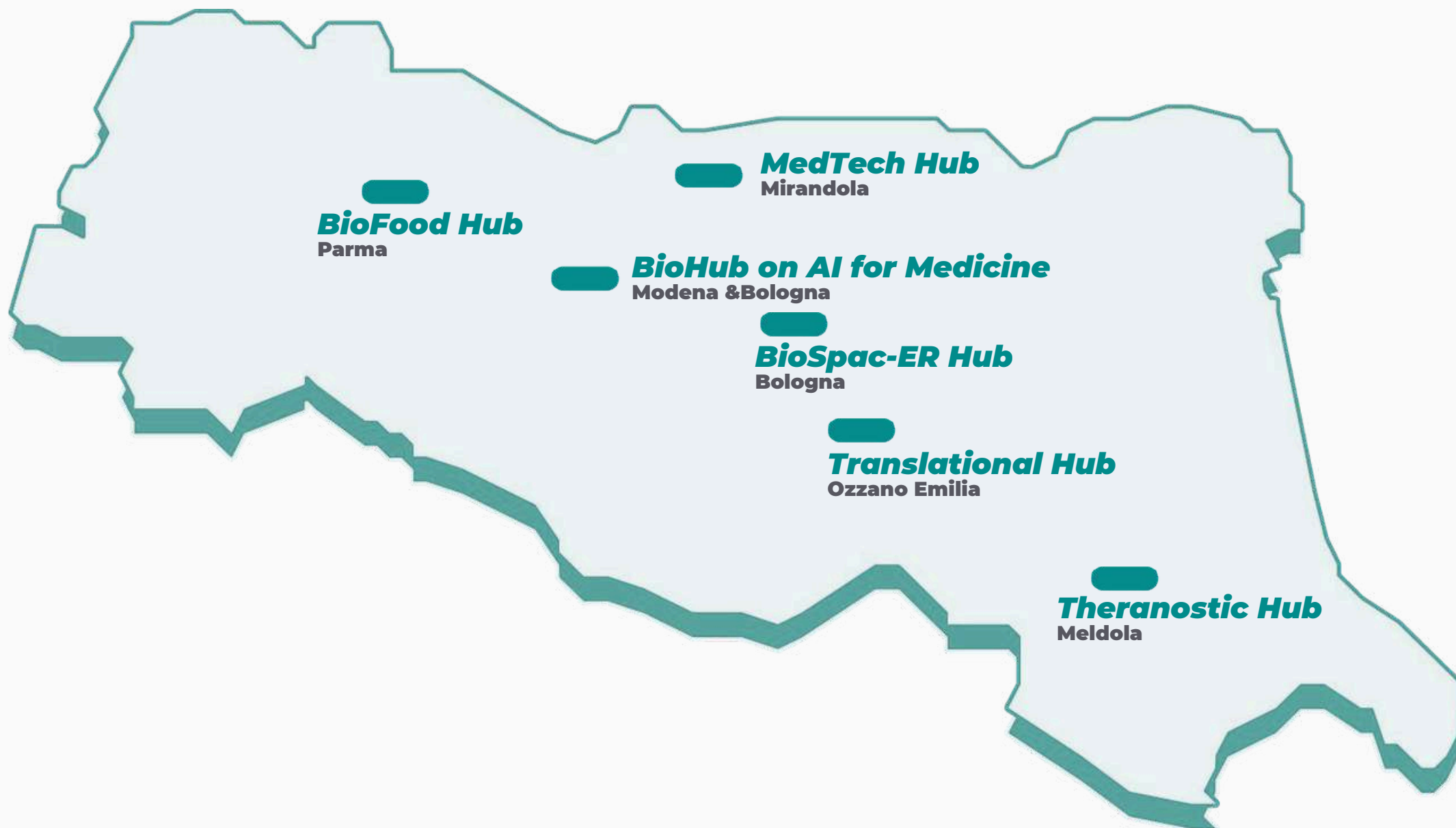
**TECHNOLOGIES
PORTFOLIO**



An introduction to the BioHubs Network

The **BioHubs network** is a regional alliance that aims to build a bridge between regional biotechnology stakeholders and the most strategic initiatives underway at the European level, establishing a regional network of competence centers dedicated to biotechnology development

Our mission is to foster innovation in the biotechnological sector by supporting the development of collaborative projects among companies, universities, and healthcare institutions. We aim to strengthen and enhance infrastructures that can act as hubs for biotechnology development, creating environments where research, industry, and clinical expertise can converge. Through the creation of dedicated working groups, we promote knowledge exchange, support technological innovation, and contribute to the sustainable growth of the biotech ecosystem.



An introduction to the portfolio

The **BioHub Technology Portfolio** has been developed as a strategic tool to showcase with a clear and structured overview the technological assets generated within the BioHubs Network for **decision-makers, companies, investors, and research stakeholders**.

Its primary purpose is to map innovations across domains, application sectors and maturity levels and to highlight high-potential areas, synergies, and opportunities for collaboration, in order to facilitate investment attraction, public-private partnerships, and impact-oriented technology transfer.

The areas

Each innovation is presented in a structured and accessible format, highlighting **key features, applications, and potential impact**. Clear descriptions cover the solution, the problem addressed, main use cases, and value for end users, the BioHub, and the wider ecosystem. Information on **development stage, technology readiness, intellectual property, regulatory aspects, and collaboration opportunities** allows quick identification of high-potential innovations and strategic partnerships.

Navigating the Technologies Portfolio

The **BioHub Technology Portfolio** is structured into dedicated sections, each corresponding to a specific BioHub and its area of intervention. This organization enables a **clear and intuitive navigation**, allowing readers to explore technologies within well-defined domains of expertise.

Each section **provides a focused view of innovations developed within the respective hub**, covering key areas such as MedTech and advanced device manufacturing, precision fermentation and sustainable food biotechnology, translational research for innovative therapies, biomaterials and bioelectronics for One Health and space applications, and advanced diagnostics and theranostics.

This structure reflects the specialization of the BioHubs while offering a comprehensive overview of the ecosystem, highlighting a diverse pipeline of technologies and facilitating the identification of opportunities for collaboration, development, and investment.



MedTech Hub

*Hub for Innovation in
Membrane, 3D Bioprinting
& Device Manufacturing*

MIRANDOLA

Human-Based Platform for Antifibrotic Drug Testing

FibroModel

Tecnopolo Mario Veronesi

TRL 5

Current Development Status

Pilot

Development Roadmap

The next development of FibroModel includes the incorporation of additional cell types and a perfusion system to further increase tissue complexity, making the model more closely representative of the clinical setting

Intellectual Property (IP) Status

- Regulatory and Compliance Aspects:

N.a.

- Patents/IP References:

granted patent n. [IT202300000345](#) and intentional patent application WO2024150259



Technology Domain

- Biotechnology
- Biomanufacturing
- Preclinical Research

Application Sector

- Pharma/Biotechnology sector: preclinical tests
- Drug Discovery
- R&D activity

Context and Need

Background

Current preclinical models poorly predict human responses, causing high drug failure rates, increased costs, and long development times. FibroModel is a bioprinted 3D tissue platform that recreates human pathological microenvironments with high fidelity, enabling more predictive drug testing while supporting Novel Approach Methodologies (NAMs) as alternatives to animal models.

Problem / Unmet Need

Current 2D and animal models poorly predict human responses, contributing to high drug failure rates during clinical trials. Predictive, scalable, human-based 3D bioprinted tissues and Novel Approach Methodologies (NAMs) are needed to improve preclinical testing and reduce animal use.

Solution Description

Technology Description

Our technology uses biofabrication and bioprinting to generate biomimetic 3D tissues reproducing the structure and biology of human pathological tissues. We developed fibrotic models and are expanding toward oncology applications. The constructs mimic extracellular matrix deposition, tissue stiffness, and stromal interactions, enabling predictive testing of drugs, biologics, nanoparticles, nucleic acids, and ATMPs through imaging, viability, and molecular analyses.

Distinctive Features / Key Innovation

The technology generates customizable biomimetic 3D tissues reproducing extracellular matrix, cell interactions, that impact on therapeutic response. It supports the use of human commercial cell lines and personalized medicine using patient-derived cells, with scalable and reproducible manufacturing

Team and Contacts

Team / Scientific Contacts

Elena Veronesi, Responsabile laboratorio MAB
e-mail: elena.veronesi@tpm.bio

Technology Transfer / BioHub Contact

Elisa Resca, Senior Researcher
E-mail: elisa.resca@tpm.bio



Use Cases and Applications

Main Use Cases

FibroModel is an own patent bioprinted 3D tissue platform reproducing fibrotic and pathological microenvironments with high fidelity. It enables predictive drug efficacy and toxicity testing by recreating extracellular matrix organization and cell interactions absent in conventional 2D models. Applications include drug screening, advanced therapies, personalized medicine and translational research

Benefits for End Users

FibroModel has attract public and private companies and also fosters new collaborations between research institutions, hospitals, and industry, particularly through the integration of patient-derived samples.

Business and Ecosystem Value

Value for the BioHub and the Regional Ecosystem

The next development of FibroModel includes the incorporation of additional cell types and a perfusion system to further increase tissue complexity, making the model more closely representative of the clinical setting.

Competitive Advantages

- **Biomimetic & Predictive:** Human in vitro platform for antifibrotic drug testing.
- **High Performance:** Recreates a physiologically relevant fibrotic microenvironment for accurate drug evaluation.
- **Fast & Reproducible:** Accelerates drug discovery with ISO 13485-compliant quality standards.
- **Ethical & Cost-Effective:** A sustainable alternative to conventional preclinical models.

Collaboration Opportunities

Type of Collaboration Sought

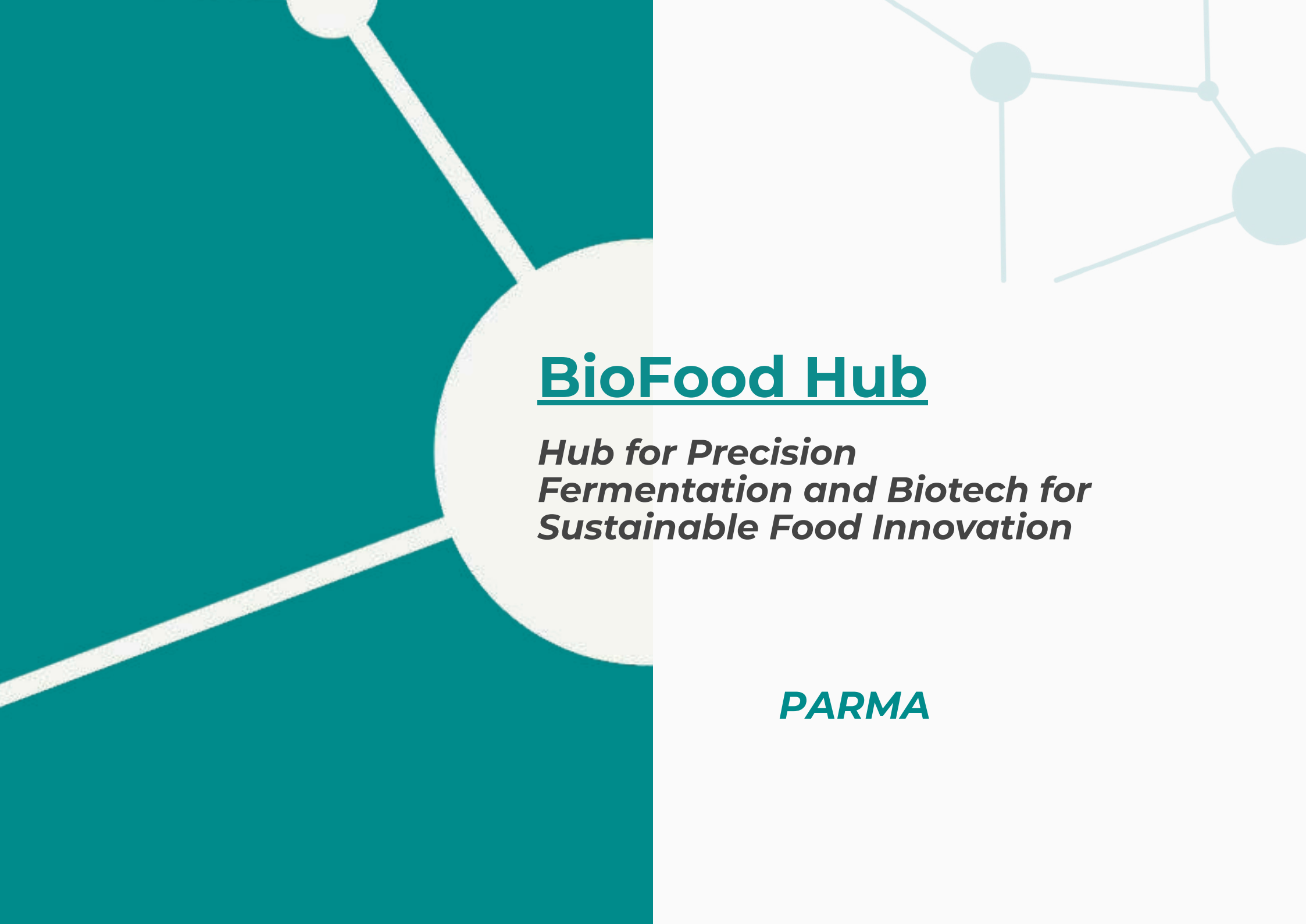
Licensing

Target Partners

CRO, pharmaceutical industry, research centers.

References and Supporting Materials

Petrachi et al, Biomed Pharmacother, 2023 DOI: [10.1016/j.biopha.2023.115146](https://doi.org/10.1016/j.biopha.2023.115146)



BioFood Hub

***Hub for Precision
Fermentation and Biotech for
Sustainable Food Innovation***

PARMA

Biotechnological Cascade Biorefinery for Health-Promoting Food Ingredients

BIOCASCADE

University of Parma

TRL 6

Current Development Status

Validation

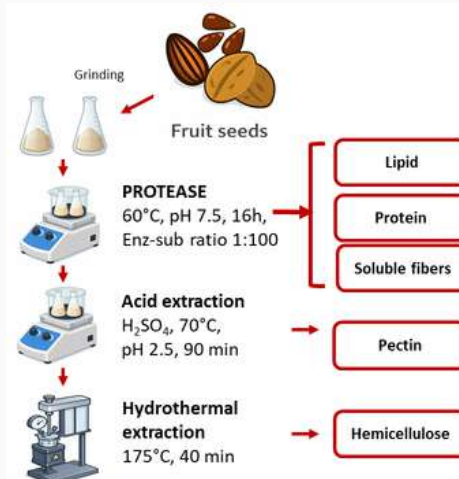
Development Roadmap

Pilot-scale biotech validation on selected industrial biomasses, functional testing, prebiotic/bioactivity assays, LCA and techno-economic assessment, regulatory evaluation and co-development with food, feed and nutraceutical companies.

Intellectual Property (IP) Status

Know-how

Regulatory and Compliance Aspects: Specific food and feed applications must be assessed according to EU regulations on novel foods, functional ingredients, feed materials and insect-derived ingredients. Safety, allergens, contaminants, traceability, HACCP/GMP, nutritional claims and health claims must be evaluated case by case.



Technology Domain

- Biotechnology
- Biomanufacturing
- Nutrition

Application Sector

Functional foods, nutraceuticals, food/feed ingredients, pet food, cosmetics, biomaterials and circular bioeconomy.

Context and Need

Background

BIOCASCADE is based on biotechnological cascade biorefinery processes to transform agri-food side-streams and insect biomass into functional ingredients. It integrates enzymes, mild bioconversion and selective fractionation to recover fibres, proteins, lipids and biopolymers with health-promoting potential.

Problem / Unmet Need

Plant by-products and insect biomass are often underused or valorised in low-value applications, despite being rich in bioactive molecules. Sustainable biotech processes are needed to obtain standardised health-promoting ingredients for food, feed and nutraceutical applications.

Solution Description

Technology Description

BIOCASCADE is a modular biotechnology platform using enzyme-assisted extraction, microbial proteases, selective precipitation and hydrothermal treatments to fractionate complex biomasses. The process sequentially recovers oils, protein hydrolysates, soluble fibres, pectins, hemicelluloses and chitin from plant side-streams and insect biomass.

Distinctive Features / Key Innovation

The key innovation is the integration of enzymatic biocatalysis and cascade biorefinery to obtain multiple functional ingredients from the same biomass, preserving sensitive molecules and generating fractions with prebiotic, nutritional and technological value.

Team and Contacts

Team / Scientific Contacts

Augusta Caligiani, Associate Professor in Food Chemistry, Food and Drug Department/Siteia
E-mail: augusta.caligiani@unipr.it

Technology Transfer / BioHub Contact

Edoardo Patterlini
E-mail: edoardo.patterlini@unipr.it

Use Cases and Applications

Main Use Cases

Production of health-promoting and functional ingredients: prebiotic fibres, pectins, oligosaccharides, protein hydrolysates, oils rich in unsaturated fatty acids, and chitin/chitosan-like fractions. Applications include functional foods, nutraceuticals, supplements, feed, pet food, cosmetics and biomaterials.

Benefits for End Users

Companies gain access to sustainable, clean-label and high-value ingredients; consumers may benefit from fibres, prebiotics, proteins and healthy lipids; the agri-food system reduces waste while increasing circularity, innovation and competitiveness.

Integration and Dependencies

Complementary Technologies / Integrations

Enzymatic biocatalysis, fermentation, microbial bioconversion, pilot-scale separation processes, GC-MS, LC-MS, NMR and HPSEC characterisation, technological functionality testing, in vitro digestion and simulated intestinal fermentation models.

Critical Dependencies and Risks

Biomass variability, seasonal availability, standardisation of bioactive fractions, microbiological stability, enzyme and scale-up costs, validation of health-promoting effects, regulatory approval, allergen management and market acceptance of insect-derived ingredients.

Business and Ecosystem Value

Value for the BioHub and the Regional Ecosystem

BIOCASCADE strengthens the BioFood Hub as a biotech platform for health-promoting ingredients from circular biomasses, connecting agri-food industries, biotechnology, nutraceuticals, feed, startups and regional value chains.

Competitive Advantages

Modular and scalable biotech platform able to recover multiple health-promoting ingredients from the same biomass. Mild enzymatic processing preserves bioactive fractions, reduces solvent use and waste, and enables high-value valorisation of agri-food side-streams and insect biomass.

Collaboration Opportunities

Type of Collaboration Sought

Co-development, Investment, Collaborative research projects

Target Partners

Food, feed, pet food, nutraceutical and cosmetic companies; agri-food processors; insect producers; ingredient companies; biotech firms; pilot plants; startups; investors and research centres.

References and Supporting Materials

- Fuso A et al., Foods, 2023. DOI: <https://doi.org/10.3390/foods12010148>
- Lolli V et al., Food Chemistry: X, 2023. DOI: <https://doi.org/10.1016/j.fochx.2023.100819>
- Viscusi P et al., LWT - Food Science and Technology, 2024. DOI: [10.1016/j.lwt.2024.116702](https://doi.org/10.1016/j.lwt.2024.116702)



XENObiotic-based PREdiction platform of inter-individual differences in drug metabolism

XENOPRED

University of Parma

TRL 3

Current Development Status

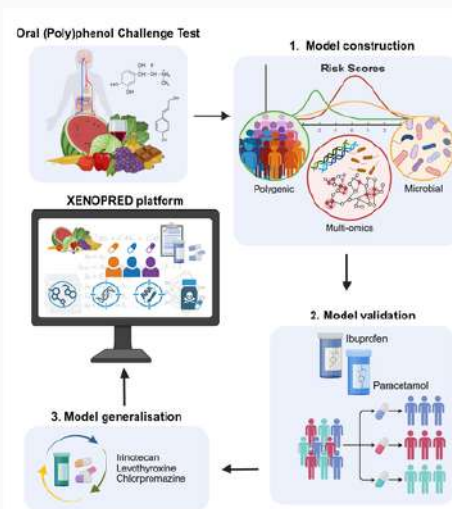
Research, Proof of Concept

Development Roadmap

Build the prediction model, test it on ibuprofen and paracetamol, explore other drugs, prepare a web demonstrator and API, and define IP, licensing and stakeholder engagement routes.

Intellectual Property (IP) Status

Know-how



Technology Domain

- Digital Health / AI / BigData
- Pharma
- Nutrition
- Precision Medicine

Application Sector

- Pharma R&D
- Clinical Decision Support
- Precision Medicine
- Drug Development

Context and Need

Background

People can process the same drug in very different ways. This can affect safety, effectiveness and development costs. XENOPRED builds on University of Parma nutritional research showing that a safe dietary test can reveal useful patterns in how each person handles plant-derived compounds.

Problem / Unmet Need

Today, no platform can reliably predict individual drug response before exposure. Moreover, available tools focus mainly on genetics and may miss other important factors, such as the gut microbiome. Companies and healthcare innovators need an earlier, safer way to anticipate who may respond differently to a drug.

Solution Description

Technology Description

XENOPRED is a digital prediction tool currently under development. It combines three types of omics information: results from a safe dietary challenge test, genetic information, and gut microbiome information. The tool produces a personalised score that can help estimate how a person may metabolise selected drugs before direct exposure.

Distinctive Features / Key Innovation

The key novelty is the use of metabolic information from a safe dietary challenge test as a functional proxy of drug metabolism. The platform combines metabolic, genetic, and gut microbiome data within a single predictive framework, offering digital modelling solutions in a single decision-support tool.

Team and Contacts

Team / Scientific Contacts

Pedro Mena, scientific lead

E-mail: pedromiguel.menaparreno@unipr.it

Technology Transfer / BioHub Contact

Elena Boni, Technology Transfer and Innovation Manager

E-mail: elena.boni@unipr.it



Use Cases and Applications

Main Use Cases

Support pharmaceutical R&D through early risk assessment, candidate prioritisation, toxicity prediction and improved trial design and personalised prescribing. Initial validation focuses on common drugs such as ibuprofen and paracetamol, with further exploration of additional drugs like irinotecan and chlorpromazine.

Benefits for End Users

For pharmaceutical companies and research managers, better prediction of metabolic variability before costly development phases. For healthcare providers and citizens, safer and more personalised drug use, fewer adverse reactions, and improved treatment effectiveness.

Business and Ecosystem Value

Value for the BioHub and the Regional Ecosystem

Positions BioFood as a bridge between food science, digital health and pharma, increasing regional visibility and creating opportunities for collaboration, technology transfer and industry partnerships.

Competitive Advantages

- **Safe and personalised:** predicts individual drug response before exposure using a non-invasive and safe dietary challenge test.
- **Beyond pharmacogenetics:** combines metabolomics, genomics, and gut microbiome data to capture key drivers of drug inter-individual variability.
- **Scalable and cost-effective:** designed for integration into existing workflows to support decision making and reduce development costs and timelines.

Collaboration Opportunities

Type of Collaboration Sought

Co-development, Collaborative research projects, pilot studies, licensing opportunities and strategic industry partnerships

Target Partners

Pharmaceutical companies, biotechnology and digital-health companies, clinical decision-support developers, CROs, AI/data SMEs, research centres, investors and public innovation programmes.

References and Supporting Materials

Mena P et al., *Curr Dev Nutr.* 2022. DOI: 10.1093/cdn/nzac072.020



Rare – Recover, Activate, Reuse

Rare

University of Parma

TRL 5

Current Development Status
Prototype

Development Roadmap

Extension of the application fields;
Market analysis through interviews with interested prospective customers; Evaluation of costs of industrial plants; Continue mapping competitors' product offerings
Creation of a spin-off.

Intellectual Property (IP) Status

Patent granted

- Regulatory and Compliance Aspects:

The regulatory aspects were under review with the support of legal consultants

- Patents/IP References:

«ANTIMICROBIALS FROM VEGETABLE WASTES» patent n. 102019000006815

Team and Contacts

Team / Scientific Contacts

Camilla Lazzi, Full Professor

E-mail: camilla.lazzi@unipr.it

Technology Transfer / BioHub Contact

Ufficio Valorizzazione

E-mail: uovalorizzazionericerca@unipr.it



Technology Domain

Biotechnology

Application Sector

- Food
- Cosmetics

Context and Need

Background

RARE is a patented biotechnology process for the circular valorisation of agri-food residues through controlled lactic acid fermentation. The process generates bioactive antimicrobial extracts for products preservation, improved microbiological stability, extended shelf life, leading to a more sustainable, resource-efficient industrial production chains.

Problem / Unmet Need

The technology addresses two converging unmet needs: sustainable management of high-volume food by-products/waste and access to natural preservatives able to improve microbiological quality and safety while complying with circular economy objectives.

Solution Description

Technology Description

The process employs selected lactic acid bacteria strains to ferment carrot, melon, and tomato by-products, promoting bioconversion of the compounds present in the matrix and releasing the antimicrobial metabolites. Bioactive compounds are subsequently recovered with solvents to obtain liquid or solid extracts, showing activity against pathogens and spoilage microorganisms in vitro and in situ.

Distinctive Features / Key Innovation

Unlike conventional single-molecule preservatives, this patent led to synergistic antimicrobial extract arising from the native phytochemical matrix and strain-driven microbial metabolism. This dual origin broadens functionality while integrating preservative efficacy with waste valorisation.



Use Cases and Applications

Main Use Cases

The antimicrobial obtained from the proposed technology can extend food products shelf life as microbiological quality and safety. It is also suitable for active packaging systems and for cosmetics and functional bio-based products, supporting transfer across multiple industrial application scenarios.

Benefits for End Users

End users benefit from more stable products, prolonged shelf life, reduced losses, improved logistics and distribution flexibility. The solution can also contribute to more sustainable, resource-efficient production systems.

Business and Ecosystem Value

Value for the BioHub and the Regional Ecosystem

It can connect waste-generating food companies, ingredient manufacturers, packaging developers, and research organisations, enabling regional circular value chains, technology transfer, pilot development, and stronger territorial attractiveness.

Competitive Advantages

Sustainability: Converts vegetable by-products into high-value natural antimicrobial ingredients, reducing waste generation, supporting circular bioeconomy principles.

• Versatile and scalable technology: Patented fermentation platform validated at laboratory scale with applications in food, cosmetics, and active packaging, facilitating future industrial scale-up.

Collaboration Opportunities

Type of Collaboration Sought

Co-development, Investment, Collaborative research projects

Target Partners

Ingredient manufacturers supplying cosmetic and food companies seeking natural preservatives; food manufacturers interested in using natural preservatives; packaging manufacturers involved in the development of active packaging solutions.

References and Supporting Materials

- Ricci A et al., Foods, 2021. DOI: 10.3390/foods10051092
- Ricci A et al., Food Control, 2025. DOI: 10.1016/j.foodcont.2025.111476
- Hadj Saadoun J et al., Foods, 2022. DOI: 10.3390/foods11071063



Translational Hub

*Translational BioHub for
innovative therapies*

Ozzano dell'Emilia

Assessment and Translational Platform for Safety and Efficacy Testing of Advanced Medicinal Products and Biologicals

ATLAS

Bologna-Ozzano Technopole – Rita Levi-Montalcini (Managing Legal Entity: Fondazione IRET ETS).

TRL 5

Current Development Status

Proof of Concept

Development Roadmap

N.A.

Intellectual Property (IP) Status

Secret Know-How & Certified Standard Operating Procedures. Methodologies and platforms owned by Fondazione IRET ETS and TransMed Research srl.

- Regulatory and Compliance Aspects

GLP & GCP certified; ALCOA & FAIR compliant data management; OPBA-authorized animal testing with AniBio; biobanks and biological sample management.

Team and Contacts

Team / Scientific Contacts

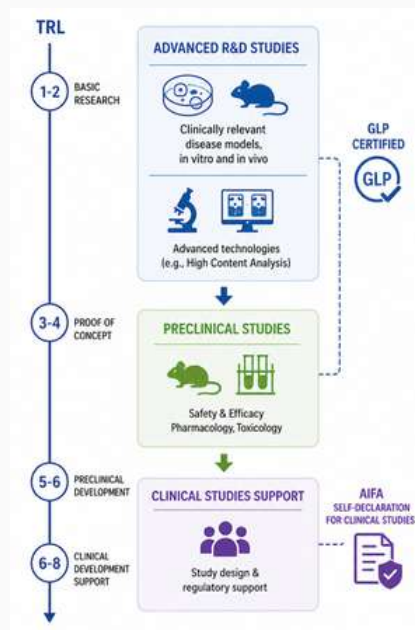
Laura Calzà, Scientific Director

E-mail: laura.calza@iret-foundation.org

Technology Transfer / BioHub Contact

Paolo Celli, IRET Vice President and Technopole Manage

E-mail: paolo.celli@tecnopolo-bo-ozzano.it



Technology Domain

- Biotechnology
- Pharma
- Preclinical Research

Application Sector

Health, Pharma R&D

Context and Need

Background

The Strategic Technologies for Europe Platform (STEP) highlights biotechnologies as critical. In this frame, the development of Advanced Therapy Medicinal Products (ATMPs), therapeutic proteins, gene therapies, nanobiotechnology requires highly specialized R&D preclinical validation infrastructures, also supported by GLP/GCLP standards when required, to bridge the gap between early-stage research and clinical trials.

Problem / Unmet Need

Biopharmaceutical and ATMP development is still hampered by high attrition rates, partly due to the lack of clinically relevant preclinical models and predictive readouts. Current in vitro and in vivo disease models are largely rooted in the small-molecule drug development paradigm and are often poorly suited to the fundamentally different biology and mechanisms of action of biologics and ATMPs. Preclinical modelling and testing therefore need to evolve towards fit-for-purpose approaches that better reflect the biological complexity and clinical context of these advanced therapies.

Solution Description

Technology Description

Integrated translational medicine platform accelerating the preclinical validation and de-risking of biologics, ATMPs, and nanoformulations through in vitro, in vivo, and AI-enabled in silico models, supported by patient-derived models, bioengineered systems, predictive workflows, GMP/GCP-compliant facilities, high-throughput technologies, and biobanking across key therapeutic areas.

Distinctive Features / Key Innovation

Science-driven R&D platform, rather than a conventional CRO: integrates scientific expertise and operational capabilities through customized studies, advanced models, and fit-for-purpose readouts tailored to biologics, ATMPs, and nanoformulations, with activities performed, when required, in GLP Test Facility and GCP Clinical Laboratory certified settings.



Use Cases and Applications

Main Use Cases

- Proof-of-Concept safety and efficacy testing for mRNA vectors, gene therapies, therapeutic proteins and nanoformulations (under restriction)
- High-throughput multi-parametric screening for personalized medicine applications using patient-derived cells
- From preclinical proof-of-concept to clinical trial: examples of translational pathway for biologicals and advanced therapies (under restriction)
- Intracellular biodistribution of nanomedicine, in vitro and in vivo

Benefits for End Users

- Pharma/Biotech Industries: speeds up R&D timelines, regulatory compliance and reduces failure risks
- Researchers & Clinicians: access to customized disease models and robust translational pipeline
- Patients & Healthcare: accelerated access to validated and innovative advanced therapies.

Integration and Dependencies

Complementary Technologies / Integrations

Translational Biohub guarantees the integration of high level technologies in each step of in-house testing. The biobank also guarantees the correct handling and sending of samples for other analyses that may be necessary for a specific medical need.

Business and Ecosystem Value

Value for the BioHub and the Regional Ecosystem

As an R&D dynamic environment sitting at the intersection of various technologies ATLAS is likely to contribute to the advancement of the whole regional innovation ecosystem.

Competitive Advantages

- Goes beyond the conventional CRO model by offering greater scientific flexibility
- Addresses complex and non-standardized translational challenges that require customized solutions
- Tailors experimental strategies to the specific scientific question and therapeutic need
- Leverages advanced disease models and technologies to generate more relevant translational insights
- Adapts study design and readouts dynamically as new scientific evidence emerges

Collaboration Opportunities

Type of Collaboration Sought

- Co-development
- Collaborative research projects

Target Partners

Pharmaceutical and biotech companies developing biologics, ATMPs and nanoformulations, Startups and SMEs focused on advanced therapeutics, Academic and translational research centers, Public-private partnerships and innovation programs.

References and Supporting Materials

- Quadalti C et al., Front Toxicol, 2025. DOI: [10.3389/ftox.2025.1561386](https://doi.org/10.3389/ftox.2025.1561386)
- Quadalti C et al., Heliyon, 2024. DOI: [10.1016/j.heliyon.2024.e40165](https://doi.org/10.1016/j.heliyon.2024.e40165)
- Noera G et al., Mil Med Res, 2024. DOI: [10.1186/s40779-024-00555-2](https://doi.org/10.1186/s40779-024-00555-2)



Theranostic Hub

*The BioHub for Advanced
Diagnostic and Theranostic*

MELDOLA

TriBILife Innovations - Antibody Discovery Platform

TriBILife

IRST – Istituto Romagnolo per lo Studio dei Tumori
"Dino Amadori" IRCCS

TRL 4

Current Development Status

Research; Proof of Concept

Development Roadmap

Short-term: complete BCR repertoire analysis for mesothelioma and validate additional antibody candidates.

Medium-term: develop ADC and CAR-T prototypes. Seek partnerships and investment to scale screening throughput and advance pre-clinical studies.

Intellectual Property (IP) Status

Patent field

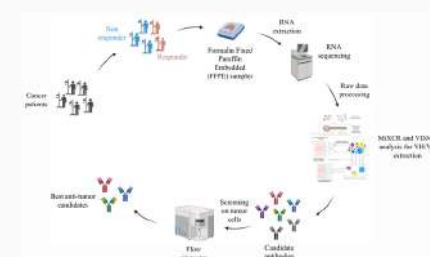
- Regulatory and Compliance Aspects:

NGS & bioinformatics platforms; clinical data management; tumor tissue and blood biobanking.

- Patents/IP References:

WO2024/188790; WO2024/188786; International PCT applications.

Ownership: IRST IRCCS.



Technology Domain

- Biotechnology
- Advanced Diagnostics & Theranostics
- Pharma

Application Sector

Oncology and precision medicine, Therapeutic antibody discovery, Novel target identification and validation, Predictive biomarkers and patient stratification, Translational and preclinical drug development

Context and Need

Background

A major limitation in oncological immunotherapy is the lack of specific tumor targets for safe, selective treatment. This is critical for NSCLC, metastatic melanoma and pleural mesothelioma, all representing significant unmet clinical needs with high incidence, aggressiveness, and limited therapeutic options.

Problem / Unmet Need

No biomolecular targets exist for mesothelioma. NSCLC and melanoma patients who are recurrent/refractory lack effective options. Current standard treatments show insufficient efficacy, highlighting a critical need for novel targeted immunotherapeutic strategies.

Solution Description

Technology Description

TriBILife Innovations is an innovative screening platform that identifies fully human antibodies against specific oncological targets using NGS of BCR repertoires. Applied to tumor tissue or peripheral blood, it selects antibody sequences from patients responsive to immune-checkpoint inhibitors, enabling reconstruction of therapeutically potent antibodies. Successfully applied to NSCLC and metastatic melanoma; extension to pleural mesothelioma is ongoing. Six antibodies identified to date.

Distinctive Features / Key Innovation

No prior antigen selection needed. Antibodies are patient-derived (fully human), ensuring biocompatibility and tolerability. They bind across multiple patients, broadening applicability. The platform integrates therapeutic and diagnostic functions, supporting personalized treatment decisions.

Team and Contacts

Team / Scientific Contacts

Massimiliano Mazza, Coordinator of the Adoptive Cell Therapy CAR T platform

E-mail: massimiliano.mazza@irst.emr.it

Technology Transfer / BioHub Contact

Giuliana Villari, Knowledge Transfer Manager

E-mail: TTO.urttf@irst.emr.it



Use Cases and Applications

Main Use Cases

- Development of antibody-drug conjugates (ADCs) for NSCLC and metastatic melanoma.
- Engineering of CAR-T cell therapies for relapsed/refractory patients.
- Companion diagnostics to identify patients most likely to benefit from specific immunotherapies.
- Extension to pleural mesothelioma to identify novel tumor-specific antibody targets.

Benefits for End Users

Patients gain access to targeted, personalized therapies with enhanced tolerability. Clinicians benefit from companion diagnostics supporting treatment decisions. Researchers and industry gain a versatile platform for novel antibody discovery.

Business and Ecosystem Value

Value for the BioHub and the Regional Ecosystem

It strengthens regional oncology and biotech supply chains, attracts strategic investors, and fosters collaborations between academic, clinical, and industrial partners within the BioHub ecosystem, enhancing competitiveness in precision oncology.

Competitive Advantages

- Discover clinically relevant targets;
- Accelerate the discovery process;
- Improve the probability of the therapeutic success.

Collaboration Opportunities

Type of Collaboration Sought

Co-development, Investment, Collaborative research projects

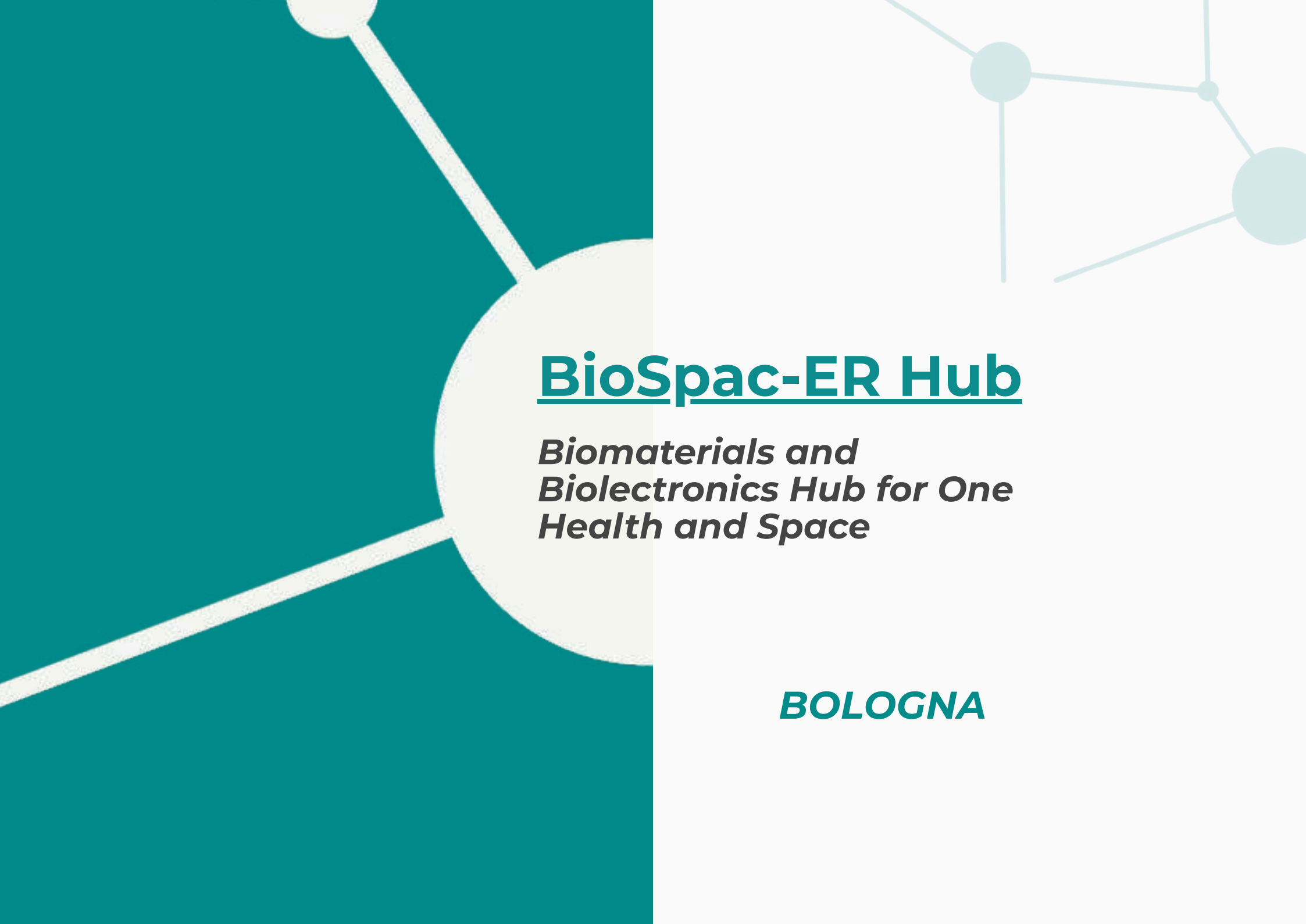
Target Partners

Strategic partners and investors to support next phases of product development (ADC/CAR-T). Biotech/pharma companies with oncology pipelines. Academic research centres with expertise in immunotherapy, antibody engineering, and clinical translation

References and Supporting Materials

Nicolini F. et al., Frontiers in Immunology, 2025. DOI: 10.3389/fimmu.2025.1636722.





BioSpac-ER Hub

***Biomaterials and
Bioelectronics Hub for One
Health and Space***

BOLOGNA

Graphene-Based Nanostructures for Sustainable (Bio)Electronics

BioSpace-ER Hub

CNR-ISOF Bologna

TRL 3/4

Current Development Status

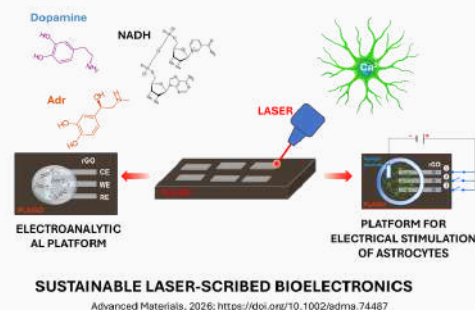
Laboratory tested technologies. Technology demonstrated through multiple proof-of-concept demonstrators

Development Roadmap

Technology maturation through collaborative projects, industrial partnerships and public/private funding opportunities

Intellectual Property (IP) Status

Know-how and background from CNR participating research Team



Technology Domain

Sustainable (Bio)Electronics and Advanced Materials

Application Sector

- Healthcare and Medical Devices;
- Bioelectronics;
- Neurotechnology;
- Sustainable Electronics;
- Environmental Monitoring.

Context and Need

Background

Advances in healthcare, wearable technologies and bioelectronics are driving the demand for multifunctional devices capable of sensing, monitoring and interacting with biological systems. At the same time, increasing attention to sustainability is fostering the development of electronic platforms based on environmentally responsible materials and manufacturing approaches.

Problem / Unmet Need

Current electronic and bioelectronic technologies often rely on complex manufacturing processes, non-renewable materials and multi-component architectures, limiting their sustainability and scalability. There is a growing need for sustainable and versatile platforms that combine sensing, actuation and biointerfacing functionalities while reducing environmental impact and supporting the goals of the European Green Deal, the United Nations Sustainable Development Goals and the One Health approach.

Solution Description

Technology Description

Development of sustainable graphene-based multifunctional (bio)electronic platforms through the integration of eco-friendly composites, laser manufacturing and functional interfaces for sensing, monitoring, actuation and bioelectronic applications.

Distinctive Features / Key Innovation

Laser manufacturing enables the rapid design and fabrication of customized electronic and bioelectronic devices through simplified and scalable processes. The approach reduces production complexity and facilitates the integration of functional interfaces directly onto sustainable substrates, potentially improving recyclability and reducing the use of conventional metal-based components. Nanostructured graphene-based electrodes provide enhanced sensing performance and enable advanced bioelectronic interfaces for next-generation healthcare applications.

Team and Contacts

Team / Scientific Contacts

Emanuele Treossi, Senior Researcher at CNR-ISOF
E-mail: emanuele.treossi@cnr.it

Alessandra Scidà, Senior Technologist at CNR-ISOF
E-mail: alessandra.scida@cnr.it

Technology Transfer / BioHub Contact

Valentina Benfenati, Research Director CNR-ISOF
E-mail: valentina.benfenati@cnr.it

Matteo Ciaschi, Responsible CNR Research Area- Bologna
E-mail: matteo.ciaschi@cnr.it



Use Cases and Applications

Main Use Cases

Bioelectronic platforms for sensing and stimulation, biosensing platforms, environmental sensing systems, smart materials and sustainable electronics.

Benefits for End Users

Sustainable electronic devices with reduced environmental impact. Nanostructured graphene-based interfaces provide multifunctional platforms with tunable conductivity, high surface area and excellent electrochemical properties, enabling next-generation healthcare applications.

Integration and Dependencies

Complementary Technologies / Integrations

The technology can provide multifunctional graphene platform to be integrated with complementary technologies such as wearable systems, microfluidics, medical devices, signal acquisition electronics and digital health solutions.

Collaboration Opportunities

Type of Collaboration Sought

Co-development, collaborative research projects, technology transfer and industrial partnerships.

Target Partners

Medical device companies, advanced materials manufacturers, healthcare institutions, research centres, SMEs, startups, and industrial partners.

Business and Ecosystem Value

Value for the BioHub and the Regional Ecosystem

The technology strengthens the regional ecosystem by fostering innovation at the intersection of sustainable materials, bioelectronics and advanced manufacturing. It promotes collaboration among research centres, healthcare institutions, SMEs, startups and industrial partners, supporting the development of next-generation healthcare, sensing and sustainable technology solutions.

Competitive Advantages

This technology combines sustainable materials, laser manufacturing and nanostructured graphene to create eco-friendly (bio)electronic devices. The approach enables rapid prototyping, simplified manufacturing, cheap and scalable fabrication, while supporting advanced sensing and biointerfacing functionalities. Its versatility, sustainability and adaptability make it suitable for a wide range of healthcare, bioelectronics and environmental monitoring applications.

References and Supporting Materials

- Scidà, A. et al., Advanced Materials, 2026
DOI:10.1002/adma.74487
- Parkula, V. et al., ACS Applied Nano Materials, 2024,
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Wearable MEMS Patch for Cardiorespiratory Monitoring

BioSpace-ER Hub

HighSenseTech S.r.l. / CNR-ISMN Bologna

TRL 4

Current Development Status

Resonant MEMS technology validated in the laboratory. Preliminary on-body tests demonstrated

Development Roadmap

Flexible skin-patch integration; optimisation of mechanical coupling and sensor placement; dedicated signal-processing algorithms

Intellectual Property (IP) Status

Background IP and proprietary know-how from HighSenseTech and CNr. Application-specific IP to be assessed

Regulatory and Compliance Aspects
Regulatory assessment will address the EU MDR pathway, skin-contact biocompatibility, electrical safety, data management and clinical validation

Team and Contacts

Team / Scientific Contacts

Fabiola Liscio, Senior Researcher at CNR-ISMN Bologna

E-mail: fabiola.liscio@cnr.it

Matteo Ferri, CEO of HighSenseTech S.r.l.

E-mail: matteo.ferri@highsensetech.com

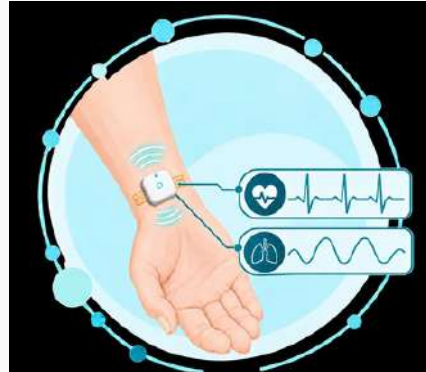
Technology Transfer / BioHub Contact

Valentina Benfenati, Research Director CNR-ISOF

E-mail: valentina.benfenati@cnr.it

Matteo Ciaschi, Responsible CNR Research Area- Bologna

E-mail: matteo.ciaschi@cnr.it



Technology Domain

- MEMS Sensors
- Wearable Bioelectronics
- Biomedical Sensing
- Digital Health

Application Sector

- Cardiorespiratory Monitoring
- Wearable Medical Devices
- Remote Patient Monitoring
- Preventive & Personalised Healthcare

Context and Need

Background

Cardiac activity and breathing produce small body-surface deformations that can provide physiological information for continuous, non-invasive monitoring

Problem / Unmet Need

Reliable measurement of these subtle deformations remains challenging, particularly in compact wearable devices intended for prolonged use

Solution Description

Technology Description

The technology combines HighSenseTech resonant MEMS strain sensors with CNR-ISMN scientific and technological support to develop a skin-mounted wearable patch. The MEMS device converts very small strains into a frequency-based output. Compact readout electronics and dedicated algorithms then extract mechanical signals generated by cardiac activity and breathing.

Distinctive Features / Key Innovation

The key innovation is the use of high-resolution resonant MEMS strain sensing for wearable physiological monitoring. Unlike conventional approaches based mainly on electrical or optical signals, the device directly measures body-surface mechanical deformation. High sensitivity, dynamic response and frequency-based readout offer the potential to extract cardiac and respiratory mechanical signatures from a single compact sensing platform.



Use Cases and Applications

Main Use Cases

- Monitoring cardiac mechanical activity and respiratory dynamics.
- Research comparisons with ECG, PPG and respiratory reference systems.
- Potential remote monitoring applications following further validation

Benefits for End Users

A compact patch could support comfortable, prolonged monitoring. Mechanical signals may complement established electrical and optical measurements for clinicians and researchers

Integration and Dependencies

Complementary Technologies / Integrations

Skin-compatible flexible substrates, low-power electronics and wireless connectivity. Integration with digital-health platforms and reference physiological measurements.

Critical Dependencies and Risks

Skin coupling, motion artefacts and sensor placement affect signal quality. Further development must address variability between users, long-term wearability, power consumption and clinical validation

Business and Ecosystem Value

Value for the BioHub and the Regional Ecosystem

The collaboration connects HighSenseTech sensing technology with CNR-ISMN expertise, creating opportunities for regional research, clinical validation and wearable-device development

Competitive Advantages

- High sensitivity to small mechanical deformations
- Frequency-based readout
- Potential combined cardiac and respiratory sensing
- Miniaturised technology suitable for wearable integration

Collaboration Opportunities

Type of Collaboration Sought

Co-development, collaborative research, clinical validation and industrial partnership

Target Partners

Clinical research centres, medical-device and wearable companies, flexible-electronics manufacturers and digital-health providers

References and Supporting Materials

Belsito L. et al, Sensors and Actuators A 239 (2016) 90–101, DOI: 10.1016/j.sna.2016.01.006

Development of Innovative Technological Approaches and Innovative 3D Models

BioSpace-ER Hub

CNR_ISMN Bologna

TRL 4/5

Current Development Status

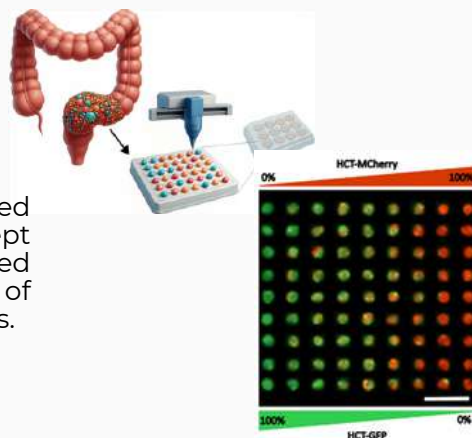
Technologies demonstrated through multiple proof-of-concept studies. Development of dedicated instruments for the production of samples using these technologies.

Development Roadmap

Technologies demonstrated through multiple proof-of-concept studies. Development of dedicated instruments for the production of samples using these technologies.

Intellectual Property (IP) Status

Patent pending ISMN-CNR



Technology Domain

3D printing, bioprinting, technological development, biomaterials, 3D model

Application Sector

- Healthcare;
- Medical Devices;
- Tissue engineering.

Context and Need

Background

Advances in 3D bioprinting, biomaterials, stem cell technologies, and microphysiological systems are enabling the development of increasingly complex and physiologically relevant human tissue models. These platforms offer new opportunities for studying disease mechanisms, evaluating therapies, and reducing dependence on animal experimentation.

Problem / Unmet Need

Current in vitro models often fail to accurately reproduce the complexity of native tissues and disease states. Moreover, innovation is frequently limited by the reliance on standardized commercial bioprinting systems, which offer restricted flexibility for technology development and process customization. There is therefore a need for novel biofabrication technologies and advanced biomimetic disease models capable of more faithfully replicating in vivo conditions and improving translational research outcomes.

Solution Description

Technology Description

Development of innovative bioprinting technologies, solutions and tools for cell-laden biofabrication, enabling the production of controlled and heterogeneous biological systems for applications in oncology, nerve regeneration, and neuropathic pain research.

Distinctive Features / Key Innovation

(Our technology is unique in that it enables the simultaneous investigation of interactions among bioprinted tissues with different cellular and biomaterial compositions within a single platform. This approach not only more closely replicates the complexity and heterogeneity of native tissues in vivo, but also enables the study of paracrine signaling and cross-talk between distinct biological compartments, providing a more realistic representation of physiological and pathological processes.

Team and Contacts

Team / Scientific Contacts

Simone Bonetti, Permanent researcher at ISMN-CNR

E-mail: simone.bonetti@cnr.it

Technology Transfer / BioHub Contact

Valentina Benfenati, Research Director CNR-ISOF

E-mail: valentina.benfenati@cnr.it

Matteo Ciaschi, Responsible CNR Research Area-Bologna

E-mail: matteo.ciaschi@cnr.it



Use Cases and Applications

Main Use Cases

Bioprinting of microstructured chip-based platforms integrating heterogeneous 3D tissue models for the investigation of interactions among distinct tumor microenvironments coexisting within the same tumor mass.

Benefits for End Users

More realistic modeling of tumor heterogeneity and microenvironment interactions, improved prediction of drug efficacy and resistance, support for personalized medicine approaches, reduction of animal testing, faster translation of laboratory discoveries into clinical applications, cost-effective and scalable platforms for research and industry.

Integration and Dependencies

Complementary Technologies / Integrations

Co-development, collaborative research projects, technology transfer and industrial partnerships.

Critical Dependencies and Risks

Integration with analytical platforms, reproducible manufacturing workflows, delayed regulatory adoption of novel in vitro models

Business and Ecosystem Value

Value for the BioHub and the Regional Ecosystem

This technology strengthens the regional innovation ecosystem by integrating bioprinting, tissue engineering, and precision medicine. It fosters collaboration among research centers, healthcare institutions, universities, and industry while enabling the development of advanced 3D tissue models for translational research, drug discovery, and personalized medicine. The platform also promotes technological innovation through the development of customized bioprinting solutions, reducing dependence on standardized commercial systems and creating opportunities for research investment and technology transfer.

Collaboration Opportunities

Type of Collaboration Sought

Pharmaceutical and biotechnology companies, Medical device and bioprinting technology companies, SMEs and startups in biotechnology, biofabrication, and regenerative medicine.

References and Supporting Materials

- Bonetti S., et al., Advanced Healthcare Materials, 2026, DOI:10.1002/adhm.71725.
- Formaggio F., et al., J. Mater. Chem. B, 2025, DOI:10.1039/D4TB02823F.



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BioHubs Network:
Website: biohubs.it
e-mail: contacts@biohubs.it



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