Iniziative PNRR nella Facoltà di Farmacia e Medicina.
Rome Technopole, Centri Nazionali e Partenariati estesi – 21/01/2025

PE6 - HEAL ITALIA - Health Extended Alliance for Innovative Therapies, Advanced Lab-research, and Integrated Approaches of Precision Medicine

- Presentazione
- Spoke 1 / Dip. Scienze e Biotecnologie medico-chirurgiche
- Spoke 5 / Dip. Chimica e tecnologie del Farmaco
- Spoke 5 / Dip. Medicina Molecolare
- Spoke 7 / Dip. Medicina Molecolare
- Spoke 8 / Dip. Sanità Pubblica e Malattie Infettive

PE8 - Age-It: Ageing Well in an Ageing Society

- Spoke 2 / Dip. Scienze Biochimiche
- Spoke 8 / Dip. Sanità Pubblica e Malattie Infettive

PE10 - ONFOODS “Modelli per un’alimentazione sostenibile

- Presentazione
- Spoke 3 / Dip. Fisiologia e Farmacologia
- Spoke 3 / Dip. Chimica e tecnologie del Farmaco
- Spoke 4 / Dip. Chimica e tecnologie del Farmaco
- Spoke 4 / Dip. Sanità Pubblica e Malattie Infettive

PE13 - One Health Basic and Translational Research Actions addressing Unmet Needs on Emerging Infectious Diseases

- Presentazione
- Spoke 1 / Dip. Medicina Molecolare
- Spoke 2 / Dip. Sanità Pubblica e Malattie Infettive
- Spoke 3 / Dip. Medicina Molecolare
- Spoke 3 / Dip. Scienze Biochimiche
- Spoke 4 / Dip. Sanità Pubblica e Malattie Infettive
- Spoke 5 / Dip. Chimica e tecnologie del Farmaco

PE15 - SCARL Space It Up

- Presentazione
- Spoke 8 / Dip. Fisiologia e Farmacologia

PNRR: Rafforzamento e creazione di Infrastrutture di Ricerca

- European Brain ReseArch INfrastructureS-Italy (EBrains-Italy)

HEAL ITALIA - Sapienza

- **Scientific Director** - Prof. D. Alvaro
- **Spoke 4 Coordinator (Sapienza)**- Prof. A. Isidori
- **Sapienza representative at HEAL ITALIA Board of Directors (CdA)** – Prof. V. Panebianco

HEAL ITALIA's Geography

HEAL ITALIA - Health Extended ALliance for Innovative Therapies, Advanced Lab-research, and Integrated Approaches of Precision Medicine

Spoke 1 Holistic Neurology	Spoke 2 Intelligent Health	Spoke 3 Prediction models	Spoke 4 *SAD Precision Diagnostics*	Spoke 5 Next-Gen Therapeutics	Spoke 6 *Health Toolbox*	Spoke 7 Prevention Strategies	Spoke 8 Clinical Exploitation
Spoke Leader TOR VERGATA	Spoke Leader UNIBO	Spoke Leader UNIPA	Spoke Leader SAPIENZA	Spoke Leader UNIMB	Spoke Leader UNIMORE	Spoke Leader UNIVPM	Spoke Leader UNIPI
Affiliates ISS NEUROMED SAPIENZA UNIBO UNICA UNIFG UNIMORE UNIVPM UNIVR	Affiliates BREX ENGINEERING IFO-IRE ISS NEUROMED SAPIENZA TOR VERGATA UNICA UNICT UNIMB UNIMORE UNIPI UNIVR UPMC	Affiliates BREX IFO-IRE IOM ISS SAPIENZA SIT TLS TOR VERGATA UNIBO UNICA UNICT UNIFG UNIMB UNIMORE UNIPI UNIVPM	Affiliates S. ORSOLA TOR VERGATA UNIBO UNICA UNICT UNIFG UNIMB UNIMORE UNIPA UNIPI UNIVPM UNIVR	Affiliates CRO Aviano ISS M.NEGRI NEUROMED OPELLA SAPIENZA SIT TLS UNIBO UNICA UNICT UNIMORE UNIPA UNIPI UNIVR UPMC	Affiliates CRO Aviano UNIBO UNICA UNICT UNIFG UNIMB UNIPA UNIPI UNIVR	Affiliates IFO-IRE ISS NEUROMED SAPIENZA UNIBO UNICA UNICT UNIFG UNIMORE UPMC	Affiliates IFO-IRE M. NEGRI S.ORSOLA SAPIENZA TLS TOR VERGATA UNIBO UNICA UNICT UNIMB UNIMORE UNIPA UNIVR UPMC

1. 3: Comunicazioni: festival of italian creativity

HEAL ITALIA - Milestones

Milestone	Descrizione Milestone
M1	Hub Establishment, Agreements &Open Kick-off
M2	Manager selection, HUB & facilities management
M3	Hub governance and planning activities (IPR and other management plans)
M4	Scientific Meetings, Public Engagement and OpenDays
M5	Web services & FAIR Open Data Platform
M6	Networking Interoperable Platforms
M7	IP&TT support services (Brokering/patenting)
M8	MOOC platform & courses management
M9	Spin-off/Start up incubation service and support
M10	Administrative and Management activities

HEAL ITALIA

- **SPOKE 1 – Holostic Nosology**
- Referente Scientifico G. Melino (Torvergata)

***Title*: From patients to molecules & back**

- **Sapienza Coordinator – G. Frati – Participants: S. Sciarretta, AL. Capriotti**

- **Proposed research**:

Genomics, Phenomics and Biomarkers
Metabolome mapping, developmente of new therapeutic targets

- **SPOKE 2 – Intelligent Health**
- Referente Scientifico S. Diciotti (UniBO)

***Title*: Health data science: data management and developement of advanced methods, algorithms and machine learning approacches integrating health bid data**

- **Coordinatore Sapienza – E. Desmaele Participants: F. Cincotti**

- **Proposed research**:

Integration and modeling of multiomic data
Development of network analysis algorithms

HEAL ITALIA

- **SPOKE 3– Prediction Models**
- Ref. Scientifico G. Stassi (UniPalermo)

***Title*: Development of advance prediction models for prognosis and therapeutic response based on comprehensive data treatment**

- **Coordinatore Sapienza – V. Patera – Participants: S. Sciarretta, AL. Capriotti**
- **Proposed research**: Innovative treatment planning system for electron FLASH radiotherapy from in silico modeling to preclinical validation in organoids and animal models for deep seated tumors

- **SPOKE 5– Nex gen Therapeutics**
- Ref. Scientifico F. Granucci (UniMIB)

***Title*: From silico to bed side design and validation of innovative tailored and personalized therapeuitc strategies**

- **Coordinatore Sapienza – M. Arca - Participants: A. Zingoni, I. Quinti, G. Caracciolo, D. Rotili**
- **Proposed research**: Identification of new therapeutic targets by screening and drug repositioning.

Development of a new generation immunotherapy to address unmet needs in cancer, infection and autoimmune diseases

SPOKE 4 STATE OF THE ART AND SPECIFIC ACTIVITIES

- **More than 20 research projects are currently active**
- For the active projects, the **main research lines and diseases to focus on were chosen**;
- **21 study protocols** have been designed, **11** of which were already **approved by LECs**;
- **All research groups have identified the staff and research teams** needed to perform the studies;
- **Analyses of equipment implementation needed** to perform study-specific analyses are in progress
- Quotes for the needed pieces of equipment are being drafted or were already asked to suppliers. The **first acquisition procedures are being completed**;
- All affiliates are updated and actively involved in the Spoke's activities, thanks to **periodic newsletters, online meetings, and internal calls**;
- **Patients' recruitment and sample analysis have started for multiple research projects**;
- **16 manuscripts have been published**, and 2 are currently under review.

HEAL ITALIA – Eventi di disseminazione

PROGRAMMA

HEAL ITALIA
Innovation on the road
Next steps 2024-2026

11 dicembre, Roma

09.00	**Saluti di benvenuto** **Domenico Alvaro** Presidente della Facoltà di Medicina e Odontoiatria - Sapienza Università di Roma **Maria Sabrina Sarto** Prorettrice alla Ricerca - Sapienza Università di Roma **Fabrizio d'Alba** Direttore Generale Policlinico Umberto I Roma **Andrea Pace** Presidente Fondazione Heal Italia **Fabrizio Colda** Dirigente del Ministero dell'Università e della Ricerca
09.30 - 11.00	**Tavola rotonda: HEAL ITALIA 2024-2026 Verso il Polo di innovazione per una Medicina di Precisione Made in Italy** Moderano: **Mauro Piacentini** Vicepresidente Fondazione Heal Italia
11.00 - 11.18	**Coffee break**
11.30 - 13.00	**Tavola rotonda: Il contributo di Heal Italia al sistema italiano della ricerca di frontiera per la Medicina di Precisione** Moderano: **Valerio Paroblanco** Direttore, Dipartimento di Scienze Radiologiche, Oncologiche e Anatomo-Patologiche Sapienza - Sapienza Università di Roma
13.00	**Chiusura dei lavori**

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PE 6 (SPOKE 1):

HOLISTIC NOSOLOGY FROM PATIENTS TO MOLECULES & BACK: Mapping the omic landscape of clinical to molecular environment, to identify, classify, and refine the phenotypes of multifactorial diseases.

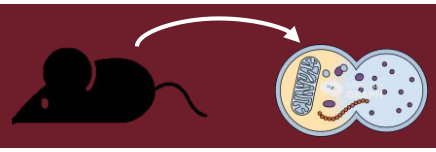
Foto: Stefania Sepulcri (Stampa e comunicazione)

CONTRIBUTO DEL DIPARTIMENTO:

Responsabile progetto: Prof. Giacomo Frati (giacomo.frati@uniroma1.it)

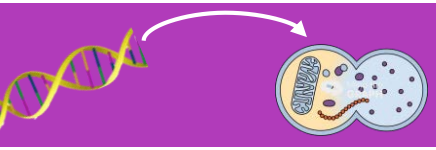
SAPIENZA UNIVERSITÀ DI ROMA
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
Ministero dell'Università e della Ricerca
Finanziato dall'Unione europea NextGenerationEU

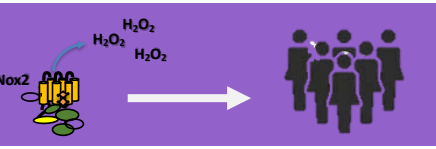
OBIETTIVI SPECIFICI

1. 
To validate in animal models of cardiovascular risk and/or damage the relevance of autophagy markers.

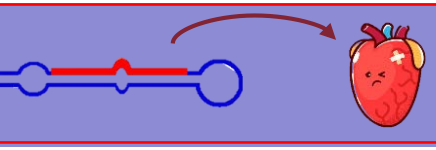
2. 

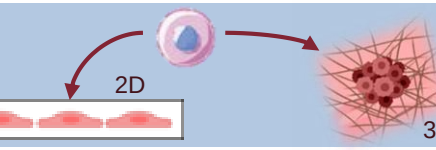
To develop a standardized method for monitoring as potential diagnostic and prognostic parameters of autophagy in patients at high risk to develop cardiovascular diseases.

3. 
To identify genetic markers of autophagy impairment in patients at high cardiovascular risk and/or with cardiovascular diseases from the Moli-Sani cohort

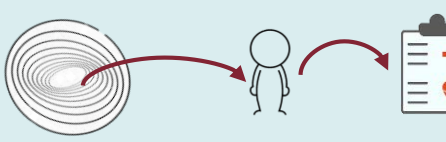
4. 

To assess circulating markers of oxidative stress in matched patients from the Moli-Sani cohort

5. 
To define the circulating miRNome of cardiovascular disease patients for correlation analysis from the Moli-Sani cohort

6. 

To validate specific cellular and molecular patterns in 2D/3D in vitro models.

7. 
To define multi-omics profiles for biological samples with clinical correlations.

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Finanziato dall'Unione europea NextGenerationEU

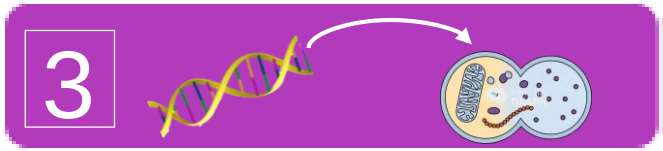
Attività eseguite/completate

To validate in animal models of cardiovascular risk and/or damage the relevance of autophagy markers.

Activity performed:
-Evaluation of markers of autophagy (LC3, p62, ATG5) in the serum and the heart collected from mice receiving activators of autophagy (trehalose, Tat-Beclin D11, starvation) and inhibitors (chloroquine, 3-MA) and in models of CVDs (I/R injury, myocardial infarction)
Demonstration that tissue levels of autophagy correlate with serum levels.

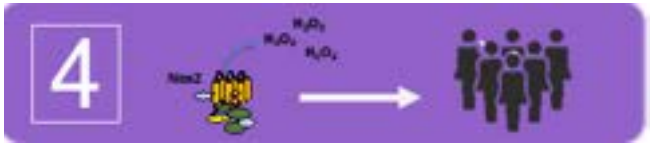
To develop a standardized method for monitoring as potential diagnostic and prognostic parameters of autophagy in patients at high risk to develop cardiovascular diseases.

Activity performed:
-Evaluation of markers of autophagy (LC3, p62, ATG5) in the serum of a subgroup of the «Moli-Sani» cohort: 462 subjects with or without hypertension. **Correlation analysis between levels of autophagy and the presence or absence of cardiovascular events.**



To identify genetic markers of autophagy impairment in patients at high cardiovascular risk and/or with cardiovascular diseases

Activity performed:
-Identification of specific SNPs within autophagy genes (ATG5, ULK1, LC3, SQSTM1) to analyze in DNA samples from subjects of the «Moli-Sani» cohort with or without cardiovascular diseases (480 sub). **Correlation analyis between the presence or absence of autophagy SNPs with disease severity and cardiovascular events**



To assess circulating markers of oxidative stress in matched patients from the Moli-Sani cohort

Activity performed:
- Assess circulating markers of oxidative stress (NOX2, H2O2,) in samples from subjects of the «Moli-Sani» cohort with or without cardiovascular diseases (480 sub). **Correlation analyis between markers of oxidative stress with disease severity and cardiovascular events**

RISULTATI ATTESI IN LINEA CON I PILASTRI DEL PNRR

Diagnostica e terapie innovative nella medicina di precisione

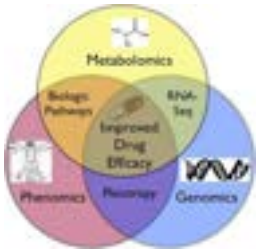
Relation to the Project
Spoke 1: Holistic Nosology

WP 1

Population mapping: DNA seq, Exome Mapping aiming at identification of pathogenic genetic variants

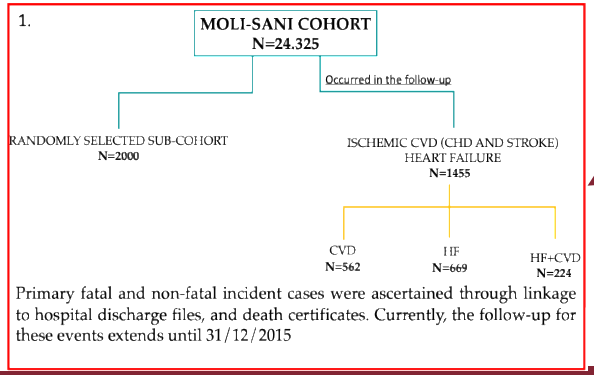
Task 1.2

Genomics, Phenomics and Biomarkers



Task 1.3

Metabolome mapping: from mouse to Moli-Sani sub-cohorts and development of new therapeutic targets

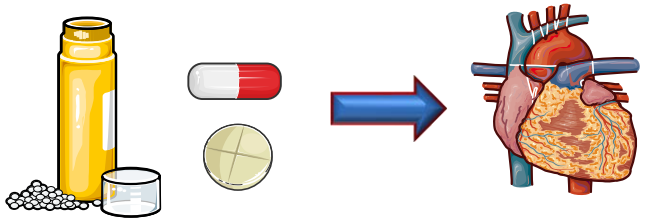


RISULTATI ATTESI IN LINEA CON I PILASTRI DEL PNRR

Diagnostica e terapie innovative nella medicina di precisione

- **Impatto previsto**: A breve e lungo termine, su economia del SSN e società

- **Beneficiari:** Popolazione a rischio cardiovascolare anche mediante l'utilizzo di attivatori naturali dei processi autofagici



- **Contatti utili:** Giacomo Frati, giacomo.frati@uniroma1.it; Sebastiano Sciarretta, sebastiano.sciarretta@uniroma1.it

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Iniziative PNRR nella Facoltà di Farmacia e Medicina.

PE6 SPOKE 5 "HEAL ITALIA - HEALTH EXTENDED ALLIANCE FOR INNOVATIVE THERAPIES, ADVANCED LAB RESEARCH, AND INTEGRATED APPROACHES OF PRECISION MEDICIN“

WP 4: Identification of new therapeutic targets by screening and drug repositioning

Foto: Stefania Sepulcri (Stampa e comunicazione)

Task 4.4: Development and validation of new radiopharmaceuticals for precision medicine

Activities at Department of Chemistry and Drug technologies, *DCTF*

Aims: Development, characterization and *in vivo* validation of new radiopharmaceuticals for theranostic applications also by «repositioning» already established radiopharmaceuticals through labeling with different radionuclides.

To convert widely used γ/β^+ radioimaging agents into **novel pure β^- emitters**

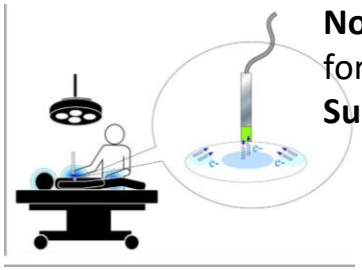
«**Repositioning Approach**»

Advantages

- **Low penetration power of electrons**
- Low background from sorrounding tissues
- Compact & easily handle probe prototypes
- Clearer delineation of radioactive tissue's margins
- Lower radiopharmaceutical activity required
- **Extended applicability**
- *Almost negligible exposure to medical team*

Design

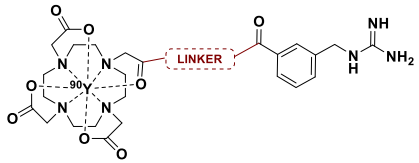
Novel Pure β^- Tracers for RadioGuided Surgery



NET-based *(NorEpinephrine Transporter)*

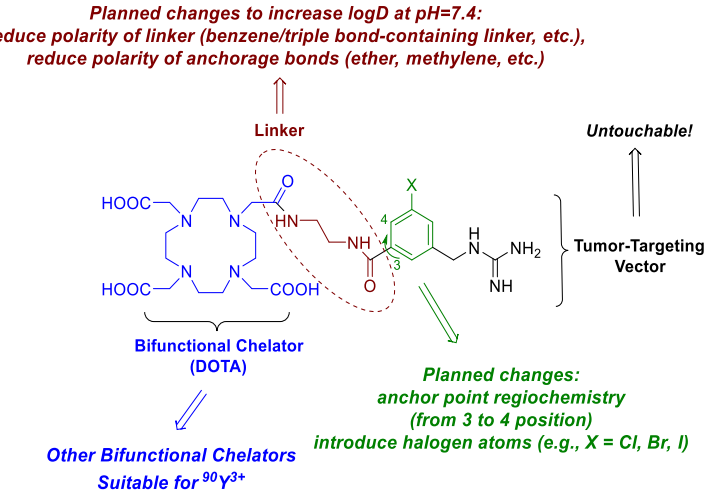
Product

Patent Priority Number (Patent for invention)
n. 102019000000202_08.01.2019



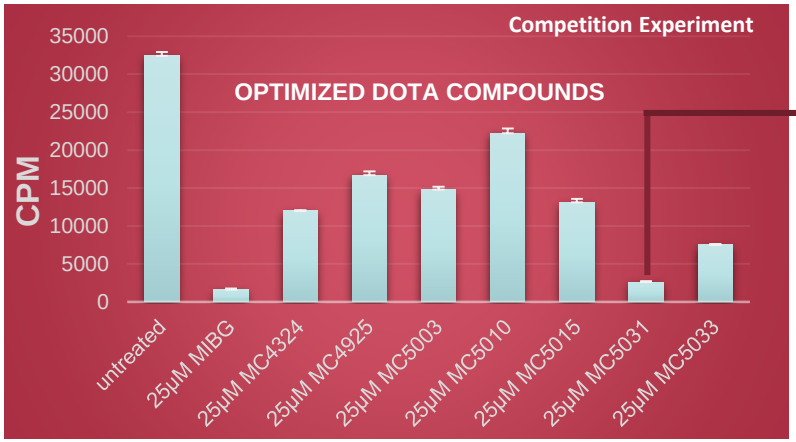
Co-Ownership
Sapienza Università di Roma 70%, Università Cattolica del Sacro Cuore 10%, Fondazione Policlinico Gemelli 20%.

Obtained Results - 1

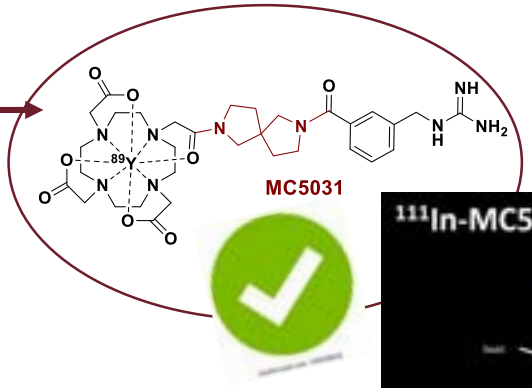


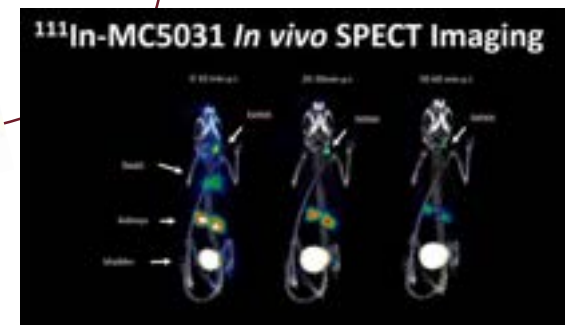
Activity 1.1 Design, synthesis, characterization, and cellular validation of **OPTIMIZED ANALOGUES** of NET SUBSTRATE REFERENCE COMPOUND (MC4324)

Objectives:
Optimization of PK and PD issues to **IMPROVING TUMOR UPTAKE IN VIVO OVER TIME** (decreased urinary clearance & increased affinity for NET)



MIBG@ 25μM (positive control)
^{3}H-NE @ 50nM, 1h incubation at 37 ° C





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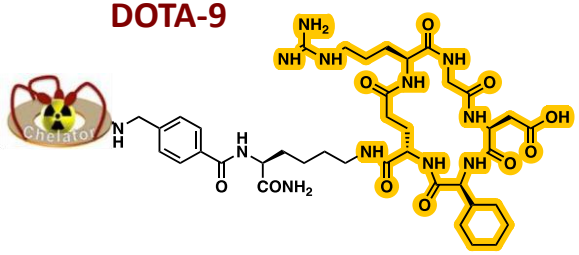
Obtained and In progress Results - 2

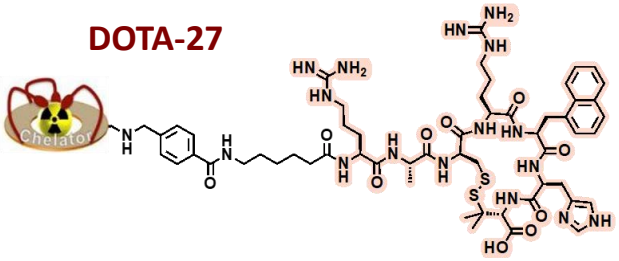
Activity 1.2 and Activity 1.3 Development **cyclic DOTA-peptide conjugates** as selective ligands of integrin **αVβ6** & C-X-C chemokine receptor type 4 (CXCR4).

already tested!

DOTA-9

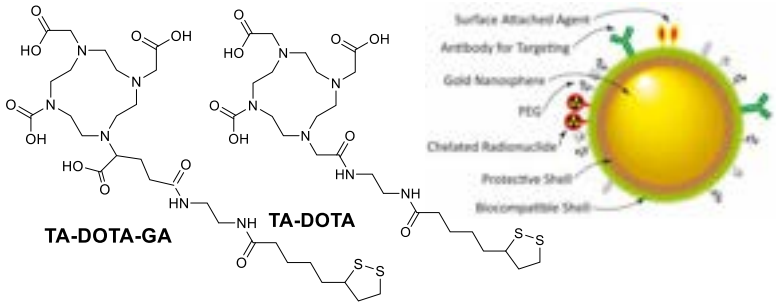


DOTA-27



^{68}Ga-DOTA-9 IC_{50} 7.4 ± 1.1 [nM] ⟵ *competitive ELISA assay* ⟶ ^{68}Ga-DOTA-27 IC_{50} 15.6 ± 4.2 [nM]

Activity 1.4 Development of DOTA-containing gold nanoparticles



in progress!

Synergies UniMIB – SAPIENZA - Roma Tre

Activity 1.5 Development of ferritin-based nanocarriers for theragnostic & radiotherapy applications

Inductively Coupled Plasma Optical Emission Spectroscopy (ICP-OES) **experiments** for the quantification of ferritin loading capability with Y^{3+}, Ga^{3+}, Lu^{3+}, Cu^{2+}, and boron-containing (BPA, BSH, etc.) samples

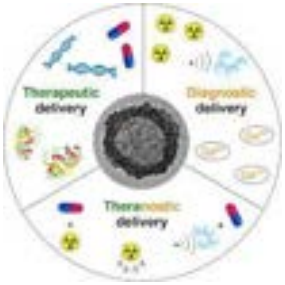
started on January 2024 at **DCTF**!

Synergies VUB - SAPIENZA - Roma Tre

Expected Project Impact

- **In short time**: an optimized beta minus radiotracer for the radioguided surgery of neuroblastoma tumor

- **Long-terms**: multiple theranostic applications



- Who will gain from our research: **Patients** and **SSN**

Contacts

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Department of Physics, Sapienza
E-mail: riccardo.faccini@uniroma1.it

Professor Dante Rotili
Department of Science, Roma Tre
E-mail: dante.rotili@uniroma3.it

Professor Alessia Ciogli
Department of CTF, Sapienza
E-mail: alessia.ciogli@uniroma1.it

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Iniziative PNRR nella Facoltà di Farmacia e Medicina.

PE6 - HEAL ITALIA: **H**ealth **E**xtended **AL**liance

For **I**nnovative **T**herapies, **A**dvanced **L**ab-research, and **I**ntegrated **A**pproaches of Precision Medicine

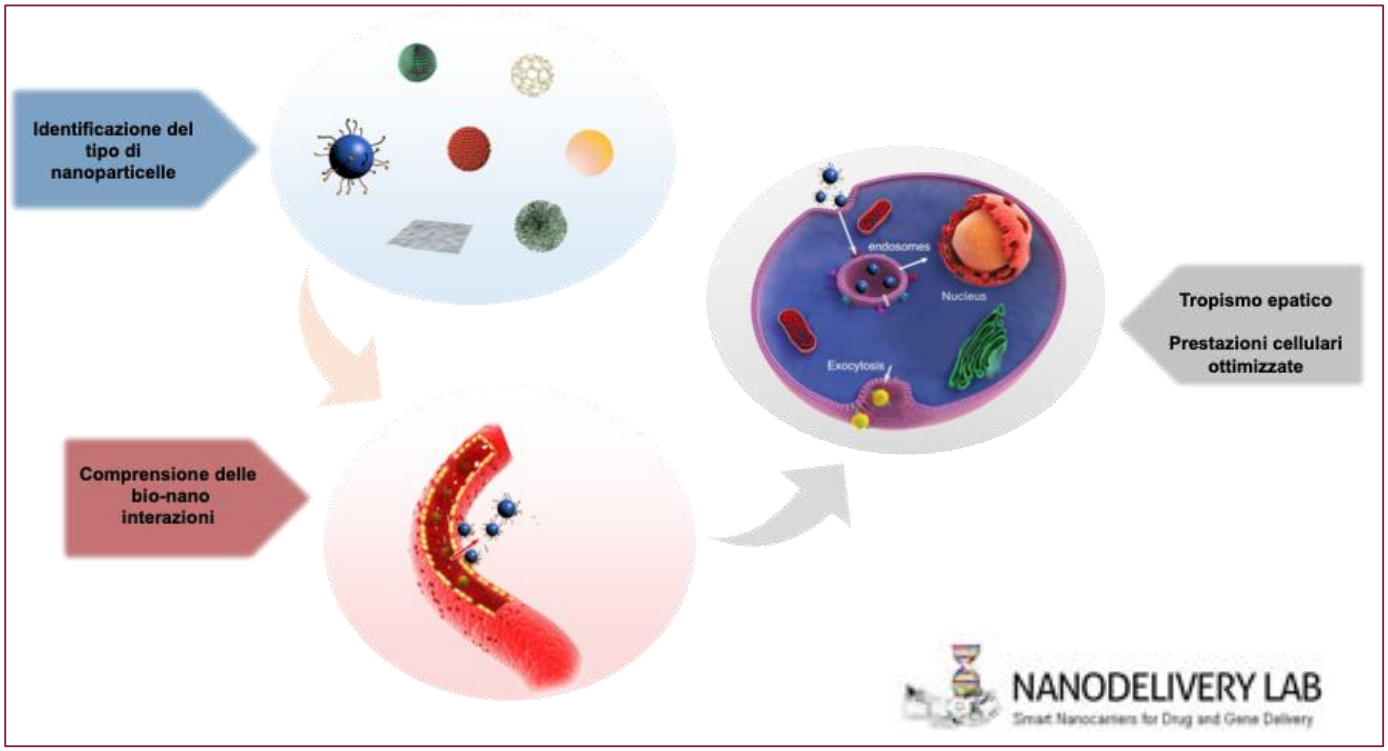
Foto: Stefania Sepulcri (Stampa e comunicazione)

Contributo del Dipartimento di Medicina Molecolare

SPOKE 5: Next Gen Therapeutics “From silico to bedside” progettazione e validazione di strategie terapeutiche innovative, su misura e personalizzate

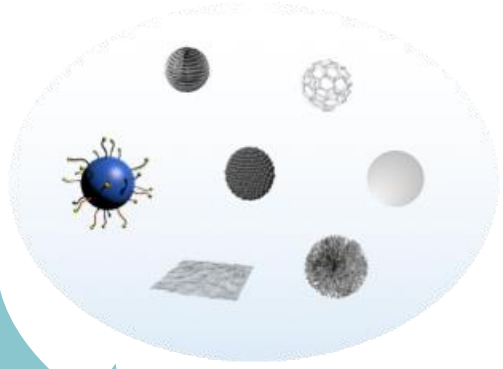
TASK 2.5: Consegna di autoantigeni (peptidi rilevanti per malattie autoimmuni) e siRNA nel fegato per indurre tolleranza e trattare malattie autoimmuni

Strategia Integrata per la Generazione di nanovettori con tropismo epatico ed elevata efficienza terapeutica



Contributo del Dipartimento di Medicina Molecolare

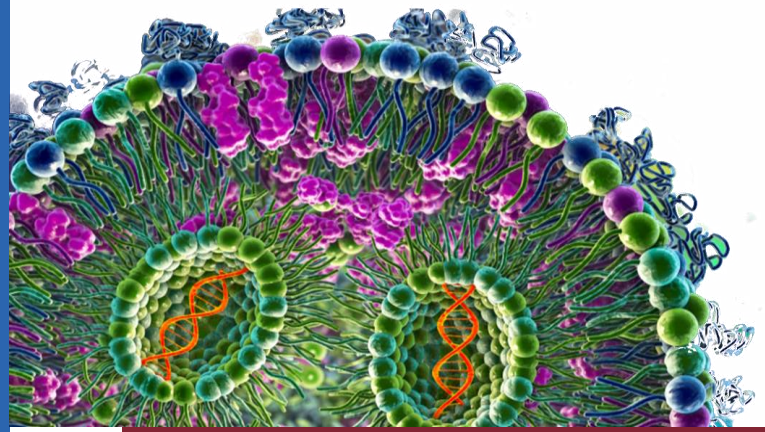
25 anni di esperienza nella progettazione e sviluppo di sistemi di rilascio di farmaci e acidi nucleici

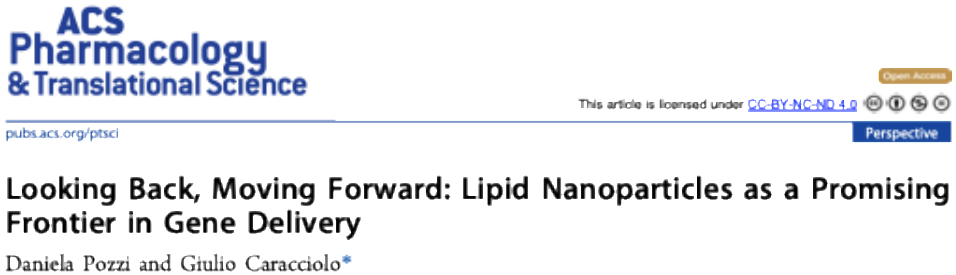


Principali vantaggi delle LNPs

- Biocompatibilità
- Incapsulamento Efficiente
- Dimensioni e Carica Modificabili
- Facilità di Produzione
- Minima Variabilità tra i Lotti
- Alta Efficienza di Trasfezione
- Bassa Citotossicità

Nanoparticelle lipidiche





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pubs.acs.org/ptsci

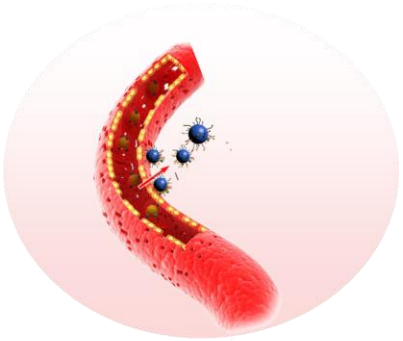
Perspective

Looking Back, Moving Forward: Lipid Nanoparticles as a Promising Frontier in Gene Delivery

Daniela Pozzi and Giulio Caracciolo*

Contributo del Dipartimento di Medicina Molecolare

Oltre 15 anni di esperienza nel campo delle bio-nano interazioni

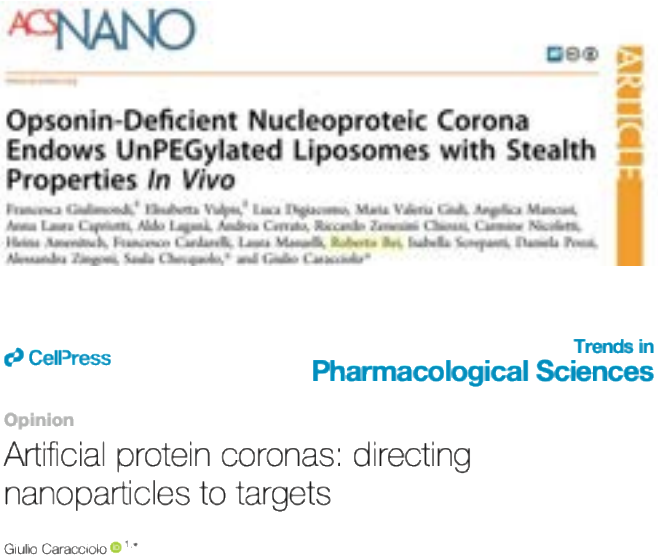


Cosa impariamo dallo studio delle bio-nano interazioni

- Stabilità delle LNP nei fluidi biologici
- Caratterizzazione della corona proteica
- Interazione con il sistema immunitario
- Profili di degradazione e clearance
- Modulazione della biodistribuzione
- Identificazione degli effetti off-target
- Impatto sull'efficienza di espressione genica
- Potenziale per la medicina personalizzata

Lipid Nanoparticles

Lipid Nanoparticles + Protein Corona



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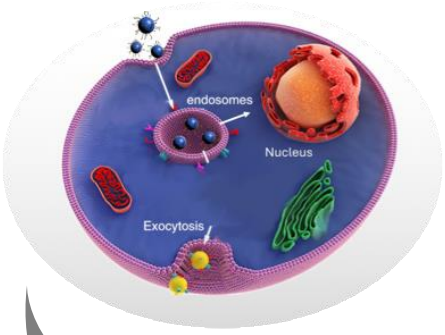
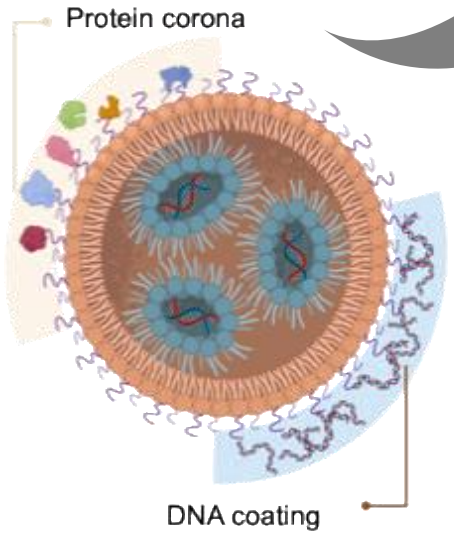
Contributo del Dipartimento di Medicina Molecolare

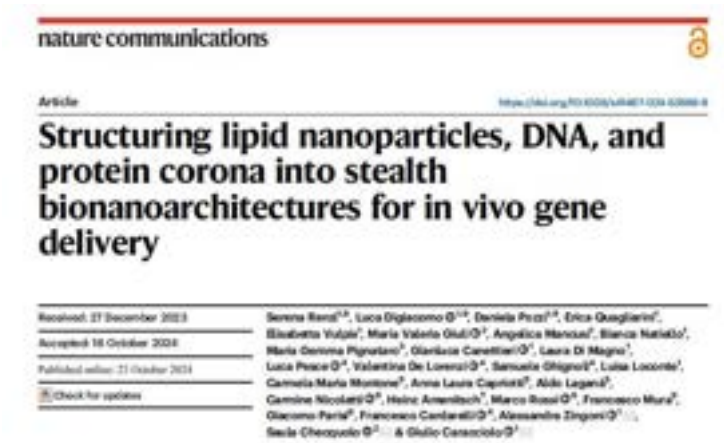
Integrare le conoscenze acquisite in innovative bio-nanoarchitetture per il rilascio di farmaci e acidi nucleici





Vantaggi delle bio-nanoarchitetture per il rilascio mirato di farmaci/acidi nucleici *in vivo*

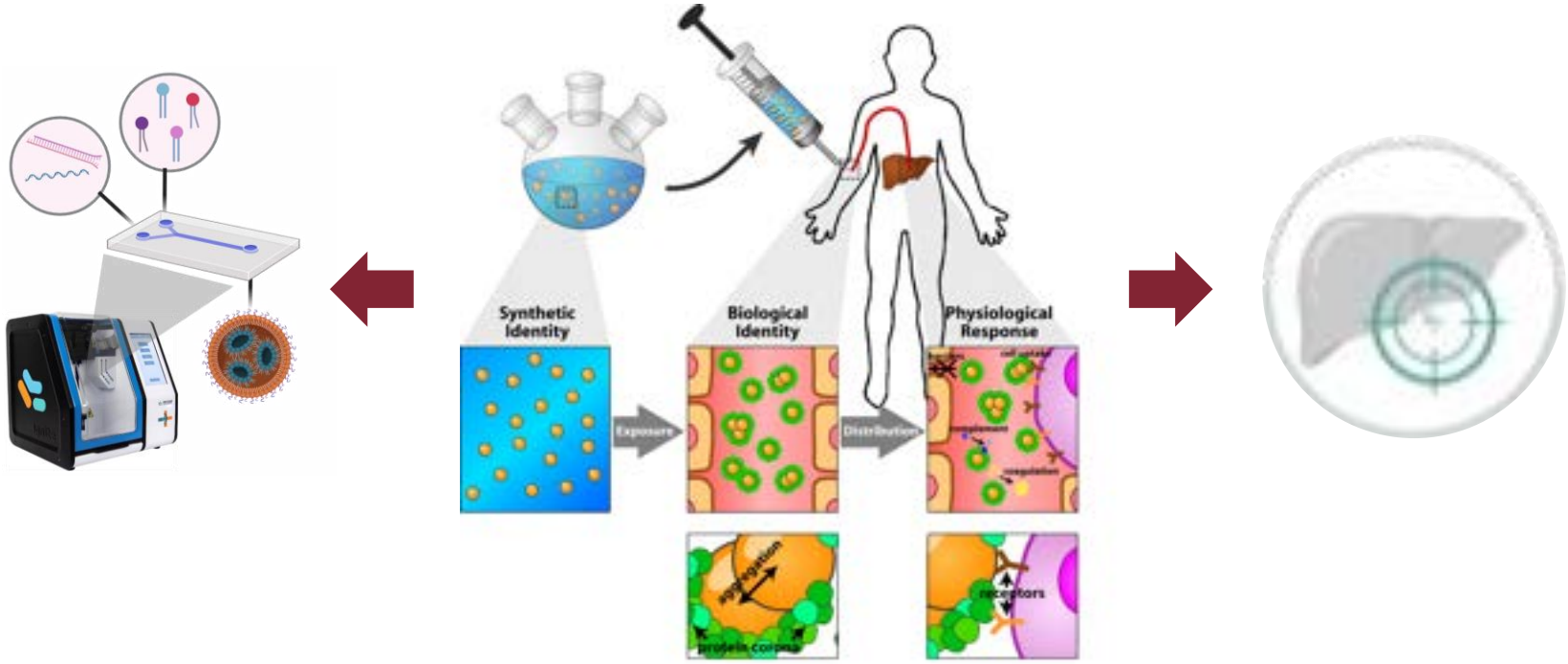
- Stabilità in Ambienti Biologici Complessi
- Modularità Funzionale → Proprietà Biofisiche Regolabili
- Ridotto Riconoscimento da parte del Sistema Immunitario
- Specificità di Targeting mediata dalla Corona Proteica
- Maggiore Uptake Cellulare
- Imitazione Naturale delle Strutture Biologiche


nature communications

Article

Structuring lipid nanoparticles, DNA, and protein corona into stealth bionanoarchitectures for in vivo gene delivery

Obiettivi specifici



Progettazione e sviluppo di **bio-nano architetture** con:

- Proprietà chimico-fisiche idonee alla veicolazione sistemica
- Inserimento di componenti *stealth* alternative al PEG
- Capacità di evadere il sistema immunitario
- Tropismo epatico
- Prestazioni ottimizzate a livello cellulare

Risultati attesi

Digitalizzazione e innovazione

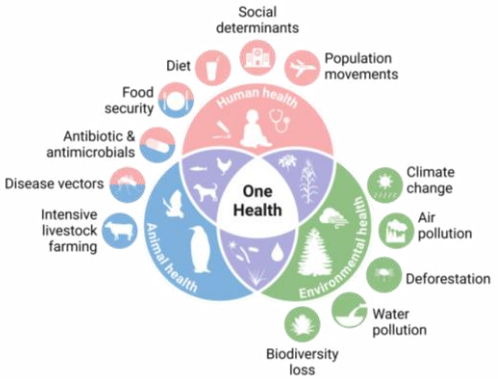
Implementazione di processi di produzione innovativi per terapie personalizzate.

Salute e Ricerca Scientifica

Nuove soluzioni terapeutiche per migliorare la qualità della vita dei pazienti con malattie autoimmuni.

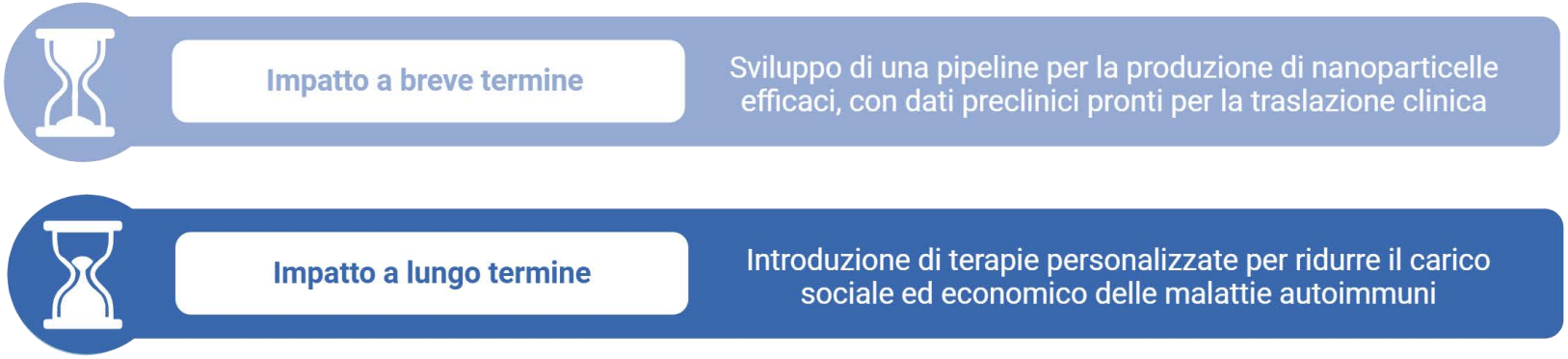
Sostenibilità Ambientale

Ottimizzazione di tecniche di sintesi chimica e biologica a basso impatto ambientale.



HEAL ITALIA adotta un approccio **One Health**

Impatto previsto



Contatti utili

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daniela.pozzi@uniroma1.it

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PE 6 FONDAZIONE HEAL ITALIA
SPOKE 7: PREVENTION STRATEGIES
LINEA TEMATICA 1: CANCER RISK PREDICTION IN THE ITALIAN POPULATION
COORDINATORE: PROF.SSA LAURA OTTINI

Foto: Stefania Sepulcri (Stampa e comunicazione)

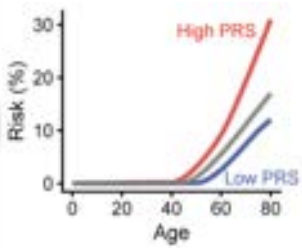
Il contributo del Dipartimento di Medicina Molecolare alle sfide dello Spoke 7

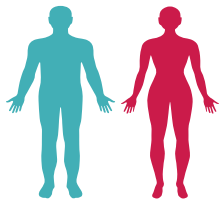
Oncologia di precisione

Integrazione di dati molecolari e clinici

Cancer risk prediction in the Italian population

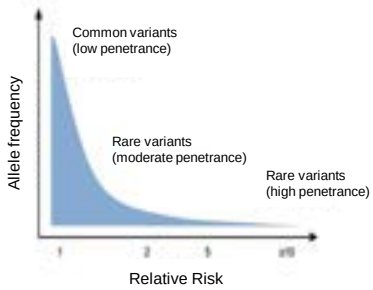
Stima del rischio oncologico





Oncologia di Genere

Modelli di predisposizione



Obiettivi specifici

Caratterizzare i modelli genetici di suscettibilità al cancro ad alta, moderata e bassa penetranza in Italia tramite tecnologie NGS

Valutare e personalizzare a livello nazionale i modelli di rischio oncologico poligenico (PRS)

Sviluppare algoritmi per la valutazione di PRS cancro-specifici e strumenti per l'analisi integrativa gene-ambiente

Risultati attesi e impatto previsto

Risultati a Breve Termine	Impatto a Lungo Termine
Creazione di nuovi paradigmi per strategie di prevenzione personalizzate	Ulteriore sviluppo dell'alta formazione nazionale sulla medicina di precisione
Identificazione di determinanti del rischio individuale di sviluppare malattie neoplastiche	Inclusione ed equità di genere nell'accesso alle misure preventive
Sviluppo di un test genomico che possa essere utilizzato e facilmente spendibile nella pratica clinica	Attuazione nel SSN dei protocolli di prevenzione (test di screening, misure di prevenzione)
Formazione di nuovi network collaborativi pubblico-privati	Creazione di nuove imprese private o spin off pubblico-private dedicate allo sviluppo e produzione di device innovativi nella prevenzione oncologica

Contatti

PE 6 FONDAZIONE HEAL ITALIA

Spoke 7: **Prevention Strategies**
https://www.healitalia.eu/prevention-strategies/

Integrated and gender medicine approaches for prevention strategies based on environmental, lifestyle and clinical biometric data

Linea tematica 1: **Cancer risk prediction in the Italian population**
Dipartimento di Medicina Molecolare

Coordinatore:
Prof.ssa Laura Ottini
laura.ottini@uniroma1.it

Componente:
Prof.ssa Valentina Silvestri
valentina.silvestri@uniroma1.it

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PE6 – HEAL ITALIA

Health Extended Alliance for Innovative Therapies, Advanced Lab-research, and Integrated Approaches of Precision Medicine

Dott.ssa Valentina Baccolini
Dipartimento di Sanita Pubblica e Malattie Infettive

Foto: Stefania Sepulcri (Stampa e comunicazione)

SPOKE 8 – WP5

From bench to bedside: the evaluation and implementation of innovative precision medicine technologies in clinical care (Leader: Sapienza, Dipartimento di Sanità Pubblica e Malattie Infettive)

Task 5.1. *Identification of the HTA evaluation process core components and key aspects regarding innovative clinical precision medicine technologies*

Participants: **Prof. Villari**, Prof. La Torre — Prof. Neri

Starting Month	Ending Month
1	36

Deliverable (M36)

- Identification of the core components and key features of the HTA evaluation process regarding innovative precision medicine technologies

Task 5.2. *Identification of the existing methodologies and development of a standardized approach to generate evidence on the clinical validity, utility, and technical aspects of innovative precision medicine technologies, and provide a tailored HTA framework to evaluate personalized procedures and promote their implementation in clinical care*

Participants: **Prof. Villari**, Prof. La Torre — Prof. Virdis

Starting Month	Ending Month
1	36

Deliverable (M36)

- Development of an evidence-based methodology to generate evidence for innovative precision medicine technologies
- Development of a new HTA framework to be used for the evaluation of innovative technologies

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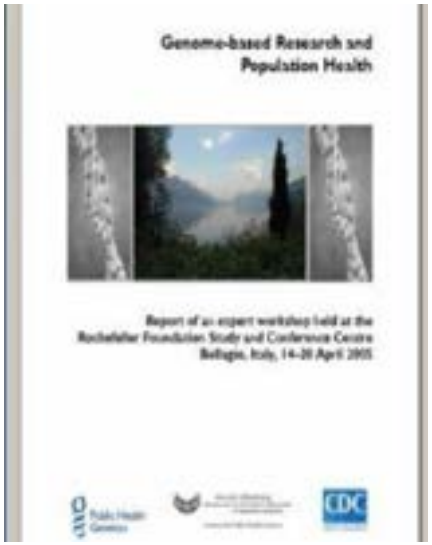
GENOMICA IN SANITÀ PUBBLICA

"*A multidisciplinary field concerned with the effective and responsible translation of genome-based knowledge and technologies to improve population health*" *(Bellagio Statement, 2006)*

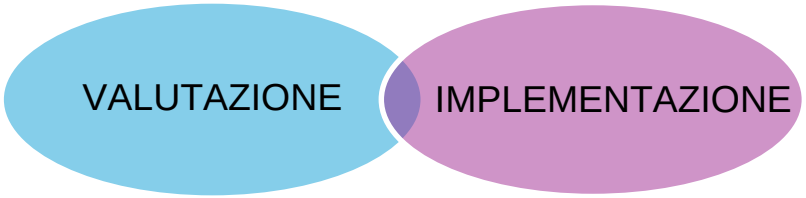


As genome-based research generates new ideas for healthcare innovation, there is a critical need for an evaluation process, based in ongoing integration of knowledge within and across multiple disciplines (including ELSI) to determine the outcomes, both health-related and social, of new genome-based applications. In the absence of a robust evaluation strategy, a trial-and-error process of innovation occurs. Resulting commercial incentives tend to promote the value of genetic tests based on the intuitive appeal of risk knowledge in the absence of proven benefit. This approach is already evident in direct-to-consumer and -physician marketing of genetic tests and represents a potential drain on healthcare resources.

There is also a risk that effective innovations will not be implemented or implemented haphazardly.

Burke, 2006

Le applicazioni genomiche devono essere **valutate rigorosamente** prima di entrare nella pratica clinica e di sanità pubblica



SPOKE 8 – WP5

From bench to bedside: the evaluation and implementation of innovative precision medicine technologies in clinical care (Leader: Sapienza, Dipartimento di Sanità Pubblica e Malattie Infettive)

Task 5.1. *Identification of the HTA evaluation process core components and key aspects regarding innovative clinical precision medicine technologies*

Milestone (M18)

1. Systematic review of HTA frameworks used for the evaluation of innovative technologies
2. Systematic review of HTA reports conducted on innovative technologies

sintesi e analisi delle evidenze

Focus su tecnologie genomiche in quanto principali applicazioni (ad oggi) della PM

1) RS dei *framework* di valutazione sviluppati in modo specifico per valutare le applicazioni genomiche
2) RS dei report HTA che valutano le tecnologie genomiche in almeno tre dimensioni

Task 5.2. *Identification of the existing methodologies and development of a standardized approach to generate evidence on the clinical validity, utility, and technical aspects of innovative precision medicine technologies, and provide a tailored HTA framework to evaluate personalized procedures and promote their implementation in clinical care*

Milestone (M18)

1. Systematic review of existing approaches and methodologies used to generate evidence regarding innovative precision medicine technologies
2. Analysis of the gaps in evidence generated regarding innovative technologies

sintesi e analisi delle evidenze

Focus su tecnologie genomiche in quanto principali applicazioni (ad oggi) della PM

1) RS delle valutazioni economiche primarie incentrate sull'utilizzo del WGS e WES nella pratica clinica
2) RS delle valutazioni economiche primarie incentrate sull'utilizzo del PRS nella pratica clinica
3) RS dei documenti che affrontano barriere e criticità nella valutazione HTA delle applicazioni genomiche

SPOKE 8 – WP5

From bench to bedside: the evaluation and implementation of innovative precision medicine technologies in clinical care (Leader: Sapienza, Dipartimento di Sanità Pubblica e Malattie Infettive)

RISULTATI ATTESI E IMPATTO

EU HTA **system** (mechanisms and procedures)

EU HTA **framework** for health technologies

PNHTADM
Piano Nazionale HTA Dispositivi Medici

Metodologia HTA
EUNetHTA

Accesso all'innovazione, inclusività ed equità

Sostenibilità, competitività, efficienza del SSN

Prof. Paolo Villari, paolo.villari@uniroma1.it
Prof. Giuseppe La Torre, giuseppe.latorre@uniroma1.it
Dott.ssa Valentina Baccolini, valentina.baccolini@uniroma1.it

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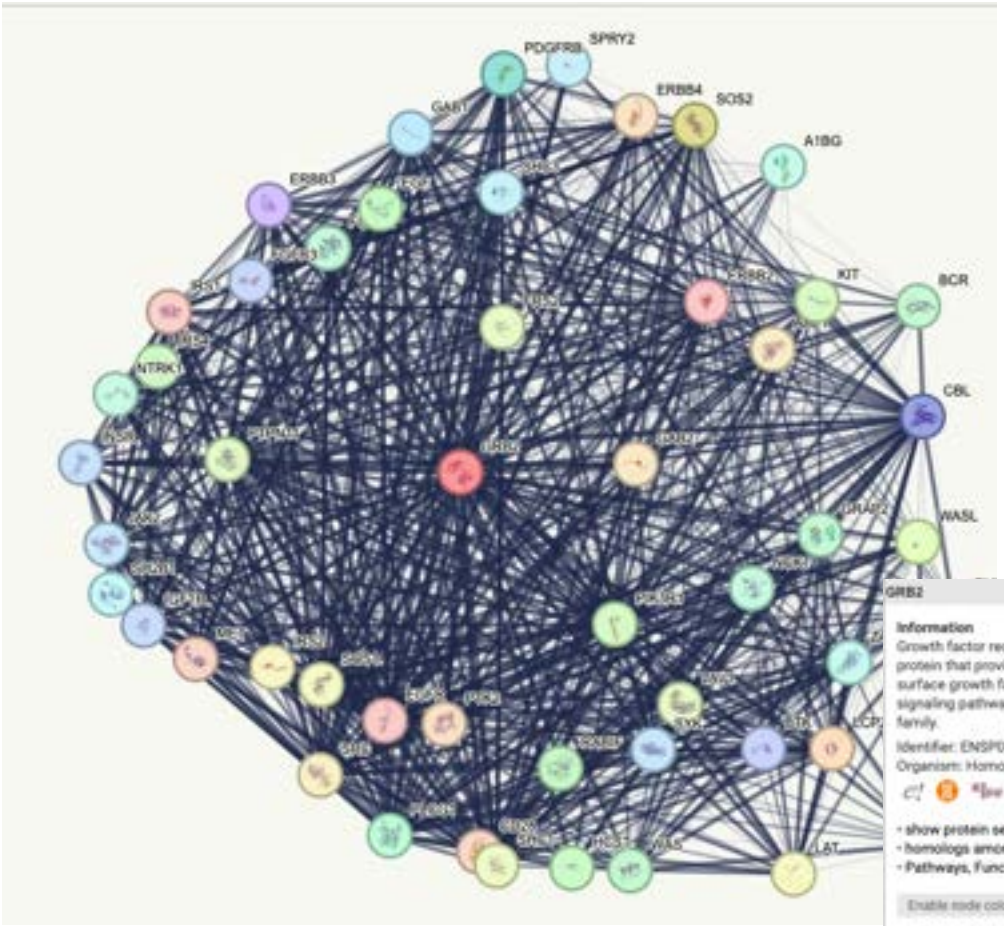
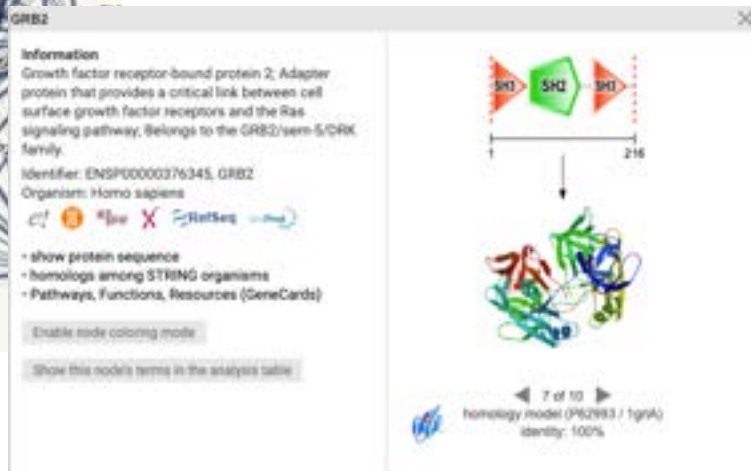
PE8 Spoke 2 - Comprendere la biologia dell'invecchiamento

Foto: Stefania Sepulcri (Stampa e comunicazione)

A focus on hub proteins





Experimental approaches

KINETICS

Advanced spectroscopies

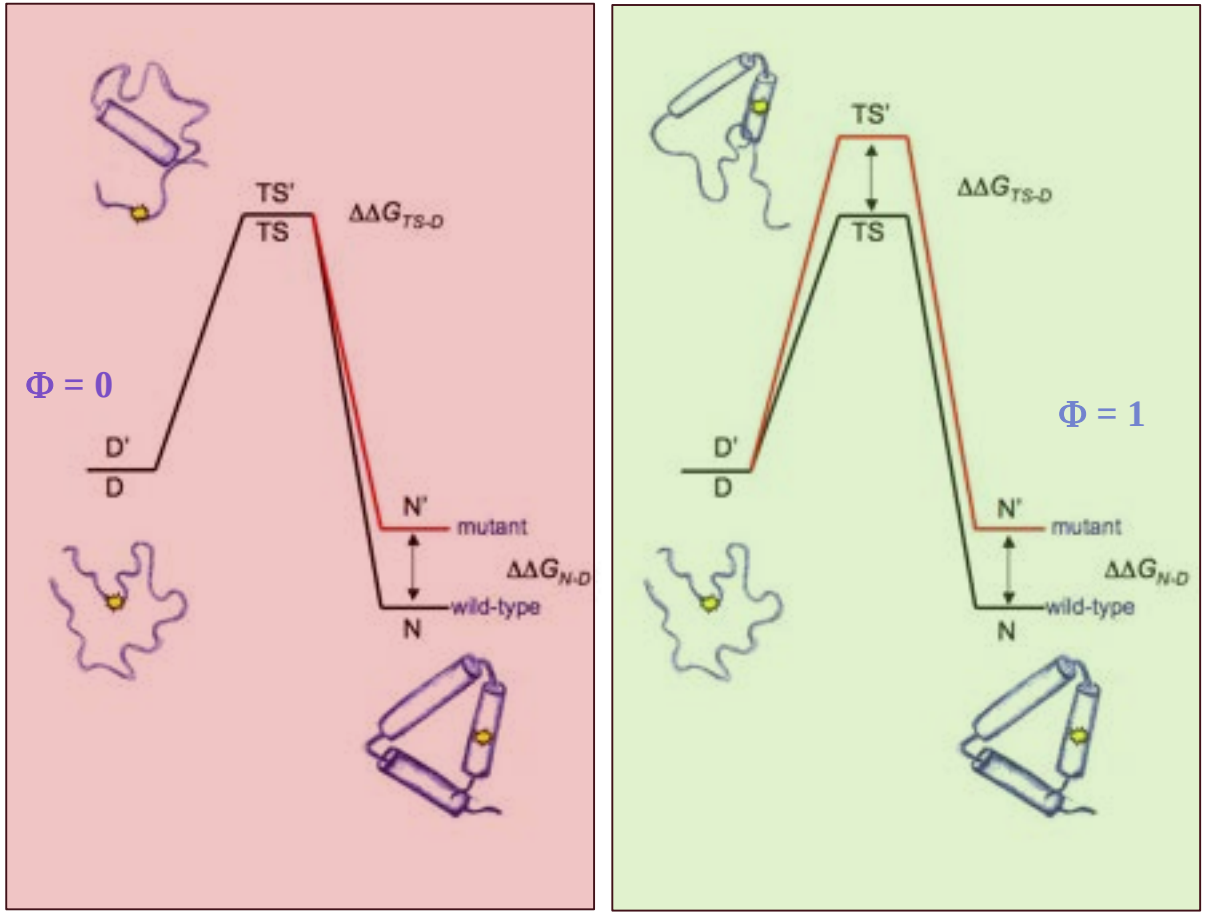
- **Stopped-flow** instruments for studying folding/unfolding processes, enzyme reaction mechanisms, rapid binding or dissociation processes.
- Hi-Tech PTJ-64 capacitor-discharge **T-jump** apparatus for faster measurements.
- **Continuous flow system** based on capillary mixing methodology.
- Equipment includes **Applied Photophysics** instruments and **spectrofotometers/fluorimeters** for sample analysis.

EQUILIBRIUM

Fluorimetry

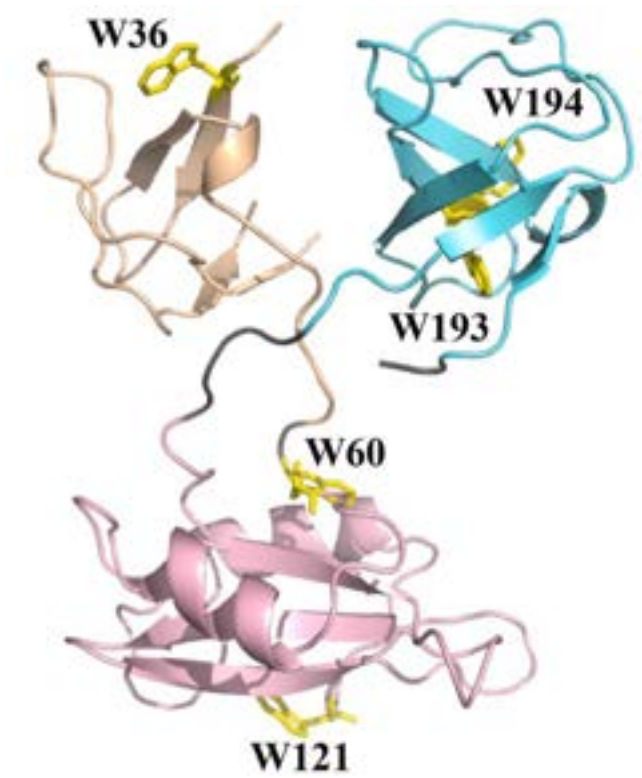
Isothermal calorimetry

Experimental approaches

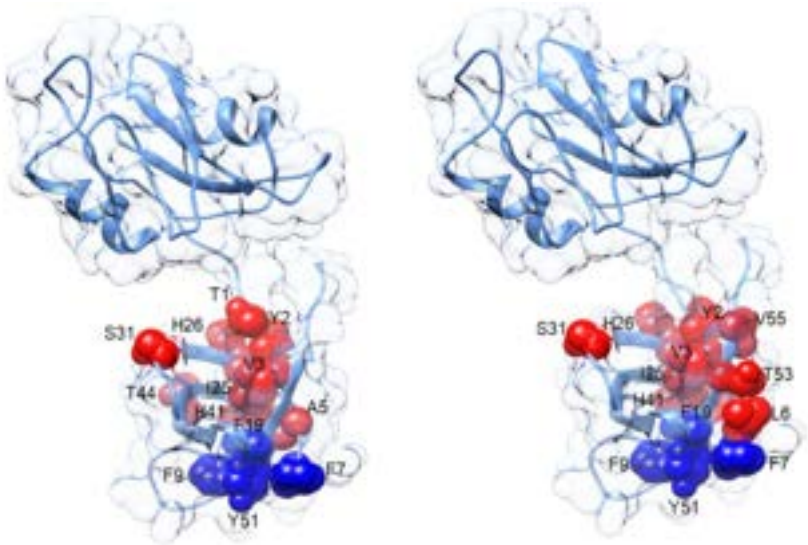


$$\Phi = \Delta\Delta G_{\ddagger\text{-}D}/\Delta\Delta G_{N\text{-}D}$$

Unveiling the allosteric network of Grb2



Grb2



Gianni and Brunori, Mol. Asp. Med., 2025
Pennacchietti et al., Protein Sci, 2024
Di Felice et al., J. Biol. Chem. 2024
Pagano et al., IJMS, 2024
Pagano et al., Biochem. Biophys. Res. Commun. 2024
Pietrangeli et al., J. Mol. Biol. 2024
Nardella et al., Protein Sci 2023
Diop et al, IJMS, 2023a
Diop et al, IJMS, 2023b

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- Valeria PENNACCHIETTI
- Mariana DI FELICE
- Costanza TACCHIA
- Julian TOSO
- Eduarda VENTURA

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PE8 - AGE-IT: Ageing Well In An Ageing Society

Prof.ssa Azzurra Massimi

Dipartimento di Sanità Pubblica e Malattie Infettive

Foto: Stefania Sepulcri (Stampa e comunicazione)

INTERVENTIONS AND TECHNOLOGIES TO REDUCE THE BURDEN OF AGE-RELATED DISEASES, DISORDERS AND DISABILITIES

WP1
In-TeMPO Study
home-dwelling older subjects

WP2
OPTIMAge-IT
hospitalised patients

WP3
I-COUNT
long term care patients

WP4
IT and **artificial intelligence** resources for data collection, analysis and sharing

WP5
Innovative technological proposals adapted to different settings (app-web, wearable devices)

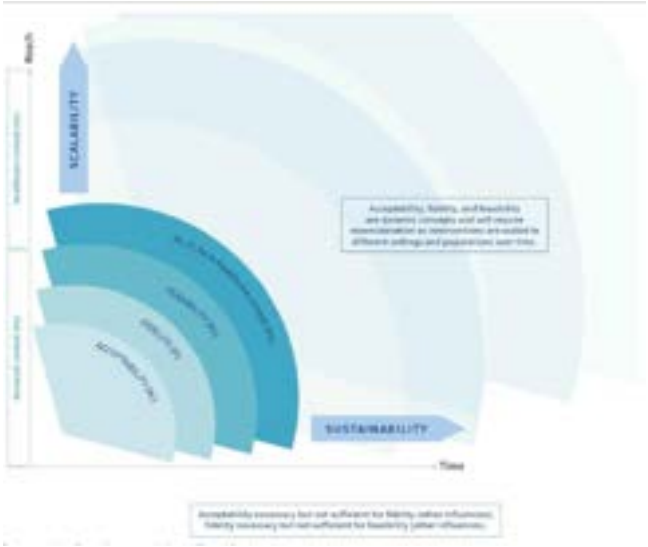
WP6
Novel interventions: **cost-effectiveness, health policies** and beyond-the-project research facilities

IMPLEMENTATION SCIENCE

Implementation Science is defined as «*the scientific study of methods to promote the systematic uptake of research findings and other evidence-based practices into routine practice and, hence, to improve the quality and effectiveness of health services and care*»

Implementation research plays a critical role in identifying strategies that support the translation of evidence into practice.

The implementation of health interventions requires the evaluation of multiple factors that can influence the outcomes of the intervention: contextual factors, organizational factors, characteristics of interventions and perception of the community/people receiving the interventions.



ACCEPTABILITY – ADOPTION – APPROPRIATENESS – FEASIBILITY – FIDELITY - IMPLEMENTATION COST – COVERAGE - SUSTAINABILITY

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WP6

Novel interventions: cost-effectiveness, health policies and beyond-the-project research facilities

Task 6.2 - Delivery models of novel interventions

Task Leader: Paolo Villari

Participants: Azzurra Massimi (Co-PI), Erika Renzi, Valentina Baccolini, Corrado De Vito

Timeline

Start date: 1 January 2024 (M13 of the project)

End date: 31 December 2025 (M36 of the project)

The WP aims to build on the data collections and analyses conducted in the previous WPs to generate knowledge useful for:

- **health managers who are interested in implementing innovative practices and technologies**
- **health professionals looking for authoritative and comprehensive training**
- **the general public who may be in need of the interventions**

EVIDENCE SYNTHESIS
M13 - M24

- EVALUATION OF ORGANIZATIONAL ASPECTS: DELIVERY PROCESSES AND MANAGEMENT ISSUES WILL BE IDENTIFIED AND CLASSIFIED THROUGH SYSTEMATIC REVIEW OF THE LITERATURE
- A An overview of systematic reviews to identify conceptual frameworks used to evaluate the implementability of multicomponent interventions to promote healthy aging in older people
- B systematic analysis of the practical guidelines related to health implementation research produced by institutional health authorities
- C development of a testable framework to guide the research process on the implementation of multicomponent interventions emerging from WP1, WP2 and WP3

CONTEXT ANALYSIS
M21 – M30

- IDENTIFICATION OF BARRIERS AND FACILITATING FACTORS: STRUCTURED INTERVIEWS WILL BE CONDUCTED TO BARRIERS AND FACILITATORS OF MULTICOMPONENT INTERVENTIONS AT DIFFERENT MANAGERIAL LEVELS
- A Creation and consultation of a panel of experts (research methodologists, biostatisticians, economists, epidemiologists, public health experts, and hospital and community health professionals) to validate the framework at the national level
- B Mixed-methods survey at different managerial levels (including decision makers, stakeholders, and customers) to identify barriers and facilitating factors for implementing multicomponent interventions.
- ASSESSMENT OF SOCIAL VALIDITY: SURVEYS WILL BE CARRIED OUT TO INVESTIGATE SOCIAL SIGNIFICANCE OF GOALS, SOCIAL ACCEPTANCE OF PROCEDURES, AND SOCIAL IMPORTANCE OF EFFECTS.

EVIDENCE TRANSFER
M32 – M36

- DISSEMINATION OF A SET OF RESOURCES FOR POLICYMAKERS AND HEALTH PROFESSIONALS TO IMPLEMENT NOVEL INTERVENTIONS THAT EFFECTIVELY PROMOTE HEALTHY AGEING IN OLDER PEOPLE

PLANNED ACTIVITIES AND EXPECTED RESULTS

EXPECTED IMPACT AND BENIFICIARIES

BENEFICIARIES	SHORT-TERM IMPACT	LONG-TERM IMPACT
CITIZENS AND COMMUNITIES	Increased access to effective and personalized healthcare interventions	Increasing the number of healthy life years
POLICY-MAKERS	Definition of a delivery model to guide the implementation of healthcare interventions	Increased scalability and sustainability of effective intervention at national level
NATIONAL HEALTH SERVICE	Increased availability of health care assessment tools	Decrease in inappropriate access to social and health services Reduced health inequalities
HEALTH CARE/SOCIAL WORKERS	Comprehensive training	Capacity building and development of good practices Local health districts and municipal social services with resources and specific tools oriented to ageing people

Contacts:
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Erika Renzi (erika.renzi@uniroma1.it)

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PE10 - ONFOODS "Modelli per un'alimentazione sostenibile"-

Spoke 3 Food Safety of Traditional and Novel Foods

Spoke 4 Food Quality and Nutrition

Foto: Stefania Sepulcri (Stampa e comunicazione)

onfoods
Research and Innovation for Sustainable Food and Nutrition

PARTENARIATI ESTESI

PE 10. MODELLI PER UN'ALIMENTAZIONE SOSTENIBILE

PE 10 115M€

SAPIENZA UNIVERSITÀ DI ROMA

3 016 125.00 €

SAPIENZA SPOKE 1	383,250.00 €
SAPIENZA SPOKE 3	651,250.00 €
SAPIENZA SPOKE 4	722,500.00 €
SAPIENZA SPOKE 5	697,125.00 €
SAPIENZA SPOKE 6	562,00.00 €

Research program

1 **GLOBAL SUSTAINABILITY**

Coordinated by UniPt

2 **SMART AND CIRCULAR FOOD SYSTEM AND DISTRIBUTION**

Coordinated by CNR

3 **FOOD SAFETY OF TRADITIONAL AND NOVEL FOODS**

Coordinated by UniBa

4 **FOOD QUALITY AND NUTRITION**

Coordinated by UniMi

5 **LIFELONG NUTRITION**

Coordinated UniNa

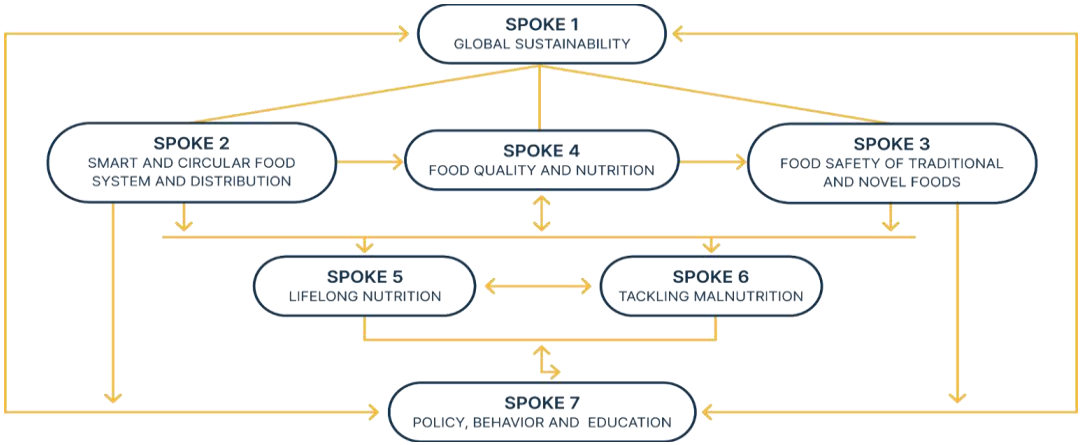
6 **MALNUTRITION**

Coordinated by UniPv

7 **POLICY, BEHAVIOR AND EDUCATION**

Coordinated by UniBo

Interconnections among the 7 Spokes



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Ministero dell'Università e della Ricerca
Finanziato dall'Unione europea NextGenerationEU

ONFOODS Goals

- To promote the sustainability of food production
- To promote the sustainability of food distribution
- To guarantee the healthy population and vulnerable subjects' food safety
- To increase the population adherence to more sustainable food models
- To develop new and smart technologies for a more sustainable production and consumption

Hub of OnFoods is composed of 11 state universities, 1 non-state university, 3 national research bodies, 3 private bodies engaged in research activities, and 6 private companies, including main national actors belonging to the agri-food sector.

onfoods

Board of Directors University of Parma
Scientific Committee
Research Manager

Partners

SAPIENZA UNIVERSITÀ DI ROMA

Lorenzo Maria Donini
Luisa Mannina

Spoke 1 Lorenzo MariaDonini
Spoke 3 Maria Elisa Crestoni
Spoke 4 Luisa Mannina
Spoke 5 Eleonora Poggiogalle
Spoke 6 Elisa Giannetta

Spoke 3

IMPROVING

MULTIMETHODOLOGICAL APPROACH TO EVALUATE CHEMICAL-BIOLOGICAL AND TOXICOLOGICAL HAZARDS

Maria Elisa Crestoni
Cinzia Ingallina
Valeria Vergine

Alessandra Gentili

Antonella Di Sotto

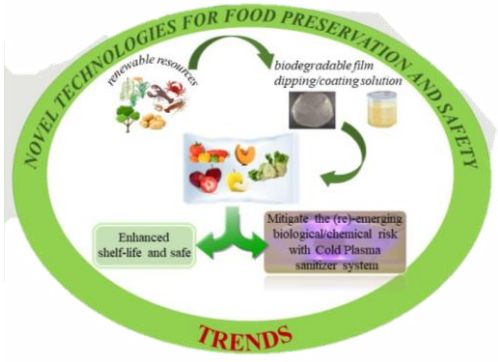
Luigi Faino
Massimo Reverberi

Marco Ruggeri

TRENDS

NOVEL TECHNOLOGIES FOR FOOD PRESERVATION AND SAFETY

Paola Russo
Marco Valente
Giuseppina Adiletta



BATMAN

DEVELOPMENT OF BIOPRESERVATION STRATEGIES BASED ON VEGETABLES, FUNGI AND STARTERS TO IMPROVE FOOD SAFETY IN BAKED FOODS

Luigi Faino
Massimo Reverberi
Marzia Beccaccioli

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Ministero dell'Università e della Ricerca
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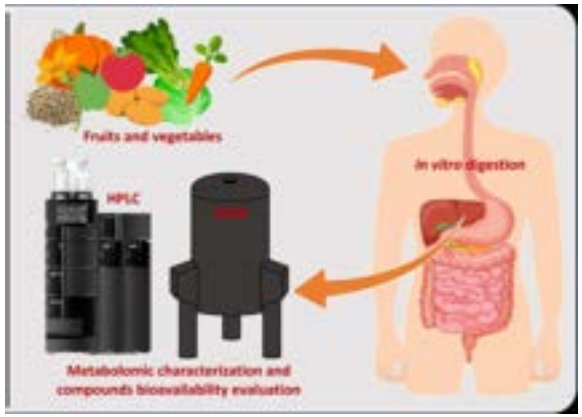
PIANO NAZIONALE DI RIPRESA E RESILIENZA

Spoke 4

VEG-FRU_GAP

MULTIMETHODOLOGICAL INVESTIGATION OF FRESH VEGETABLES AND FRUITS DURING THE GASTROINTESTINAL TRACT PROGRESSION



Luisa Mannina
Giacomo Di Matteo
Andrea Salvo

Luciano Galantini
Iolanda Francolini

Annabella Vitalone

Marzia Beccaccioli

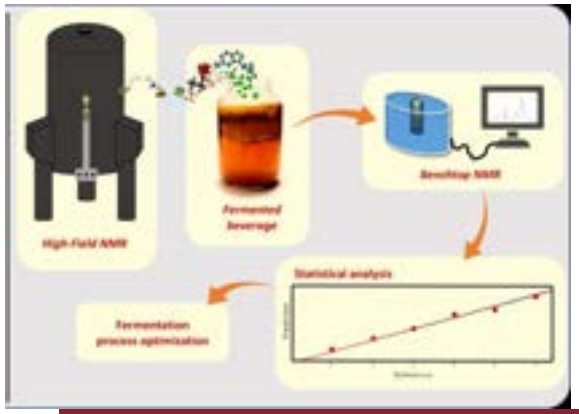
Maria De Giusti

Anna Maria Tarola

Anna Maria Giusti

FERMENT_AGES

FERMENTED BEVERAGES STUDIED BY A METABOLOMICS APPROACH



EDINMET

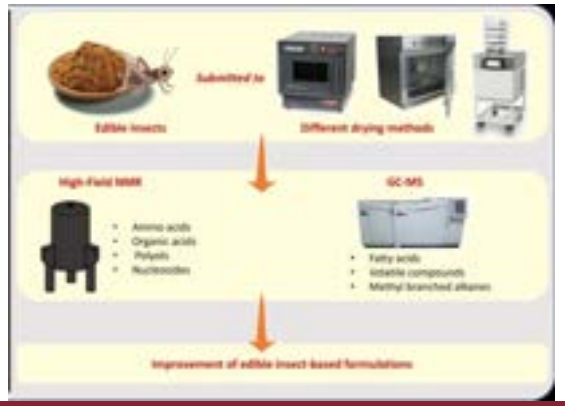
EDIBLE INSECTS' CHARACTERIZATION THROUGH UNTARGETED AND TARGETED METHODS

Luisa Mannina
Giacomo Di Matteo
Mattia Spano
Andrea Salvo
Davide Corinti

Anna Maria Giusti

Manuel Sergi

Marco Bravi



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Spoke 4

SMART-DRY

SMART DRYING OF FRUIT AND VEGETABLES

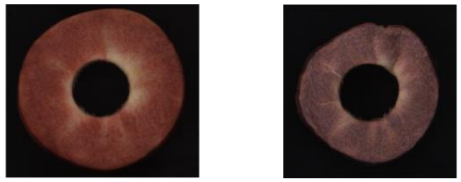
Implementation of Process Analytical Technologies (PAT) in combination with a Quality-by-Design approach
- Case study: dehydration of red-fleshed apple, var. Kissabel® -

- Sample preparation -

Apple slices
(5-mm thick)

Apples (Malus domestica Borkh) of the Kissabel variety have been sliced, dipped in deionized water for 3 minutes, and then dehydrated in a smart of hot-air cabinet dryer.

- Process monitoring -

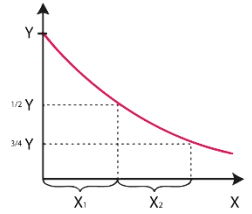


Drying at 35 °C, R.H. 35 % and air velocity 3 m/s

- Colour data (CMOS camera)
- Spatial data (CMOS camera)
- Weight loss (load cell)

PAT and QbD have been integrated into the dryer for i) monitoring the product quality during drying and ii) the development of predictive models for product moisture that are independent of time.

- Model development -



Prediction model of moisture content

- Time-dependent (thin-layer models)
- Time-independent (shrinkage models)

Time-independent models relate the change in size of the product with its moisture content. The technique has potential for monitoring process sustainability and heterogeneity.

DIBAF | DIPARTIMENTO PER LA INNOVAZIONE NEI SISTEMI BIOLOGICI, AGROALIMENTARI E FORESTALI

Riccardo Massantini
Roberto Moscetti

UNIVERSITÀ DEGLI STUDI DELLA TUSCIA

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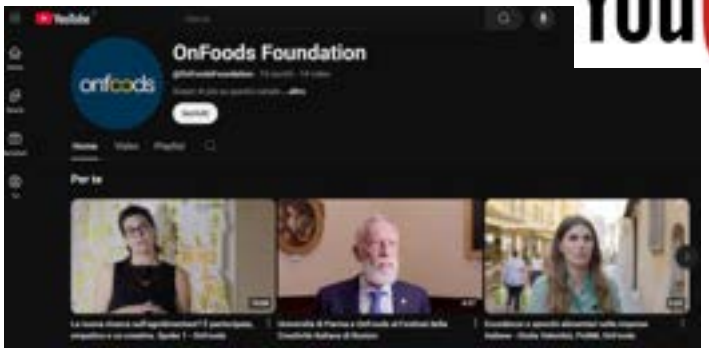
Dissemination

Website: https://onfoods.it/

- Social media



https://www.youtube.com/@OnFoodsFoundation

https://www.linkedin.com/company/onfoods-foundation

Thank for your attention

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Iniziative PNRR nella Facoltà di Farmacia e Medicina.

PE10 - ONFOODS “Modelli per un’alimentazione sostenibile”
Spoke 3- Food Safety of Traditional and Novel Foods

Dipartimento di Fisiologia e Farmacologia “V. Erspamer”
Prof.ssa Antonella Di Sotto

Foto: Stefania Sepulcri (Stampa e comunicazione)

PE10 - ONFOODS “Modelli per un’alimentazione sostenibile”

Research and Innovation for Sustainable Food and Nutrition

Department of Physiology and Pharmacology “V. Erspamer”

SPOKE 3 — Promoting a safe food innovation

Food Safety of Traditional and Novel Foods

Evaluation of new, and (re)emerging risks in the food system and development of strategies for ensuring the safety and healthiness of food.

- **To increase the quality of foods and diets**
- **To develop smart innovative technologies for a sustainable food production and consumption**
- **To guarantee food safety and food security at whole population level and in specific vulnerable targets of the population**

SPOKE 4 — To push towards sustainable and tailored food and nutrition

Food Quality and Nutrition

To improve the quality of food, diet, and nutrition to promote consumer health also considering the large inter-individual variability of response to the diet in the direction of a careful personalization of consumption.

- **To promote the sustainability of food production**
- **To promote the sustainability of food distribution**
- **To increase the quality of foods and diets**
- **To develop smart innovative technologies for a sustainable food production and consumption**

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Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

PE10 - ONFOODS “Modelli per un’alimentazione sostenibile”

Department of Physiology and Pharmacology “V. Erspamer”

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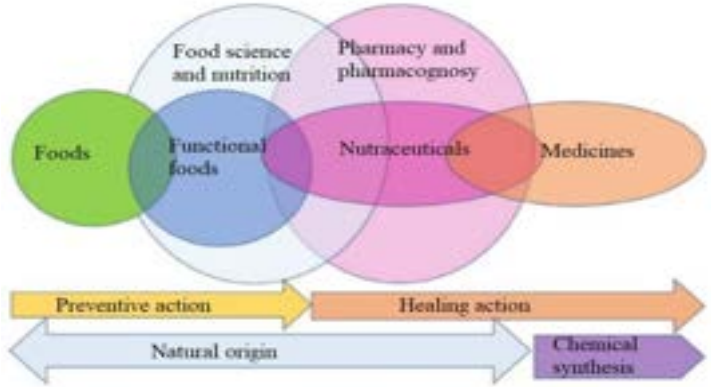
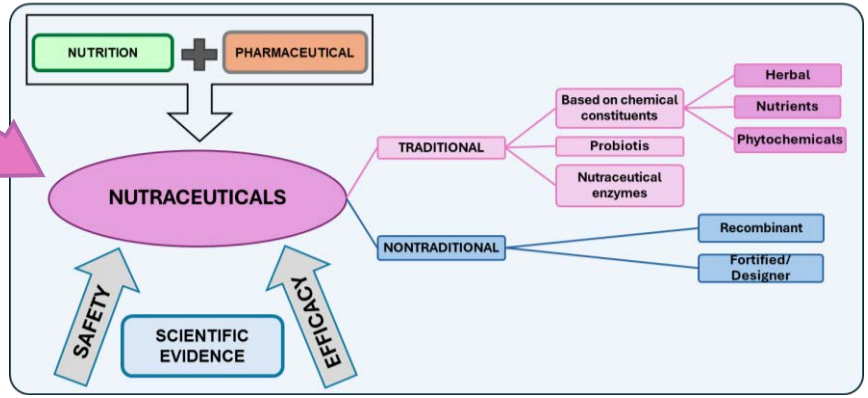
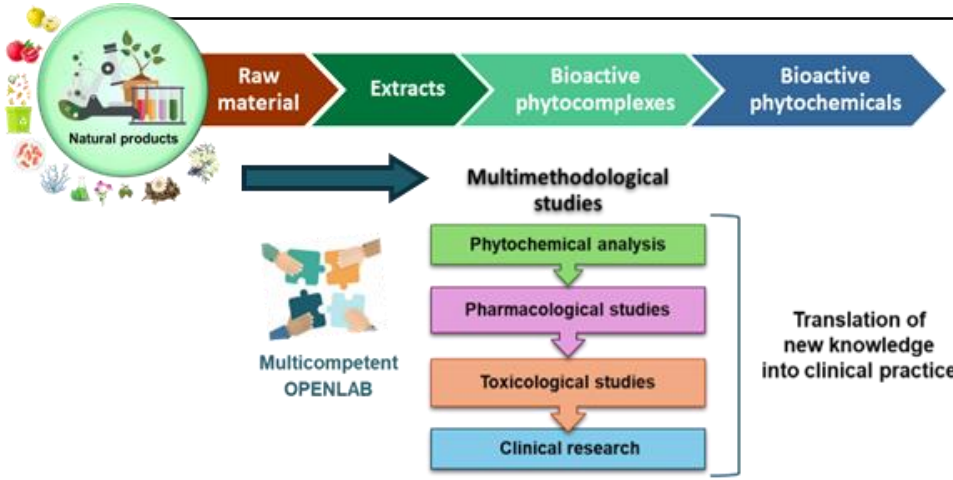
for Sustainable Food and Nutrition

Contribution

Let food be thy medicine and medicine be thy food







Pharmacological and Toxicological Research contributes to ensure safety, efficacy, and innovation in the field of Foods and Nutraceuticals

- Safety of food, nutraceuticals and additives
- Development of bioactive compounds and phytocomplexes for nutraceutical purposes
- Emerging risks in food systems
- Drug-food interactions and personalized nutrition
- Innovation in sustainable food systems (cultivation, production, storage)

PE10 - ONFOODS “Modelli per un’alimentazione sostenibile”

Department of Physiology and Pharmacology “V. Erspamer”

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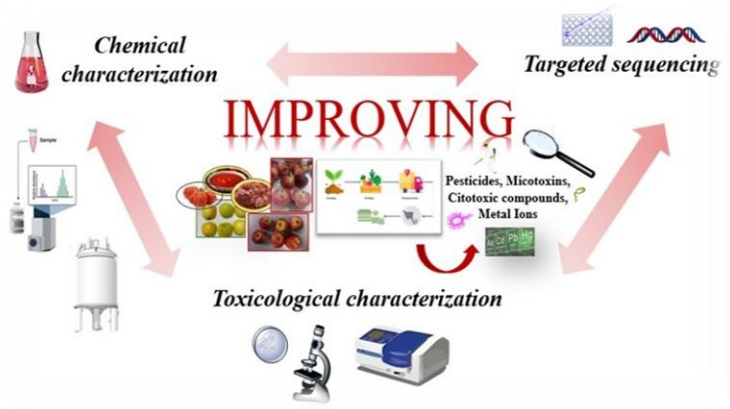
Research and Innovation
for Sustainable Food and Nutrition

Specific objectives

- Identification and characterization of new and (re)-emerging hazards in traditional food products
- Integrated methodologies for risk assessment and risk-benefit assessment of novel foods and nutraceuticals
- Development of novel bioactive ingredients for food and health applications and pharmacological profiling
- Evaluation of sustainable farming practices and their impact on food quality
- Characterization of new/existing food packaging materials/systems (in collaboration with Dept. of Chemical Engineering Materials Environment)

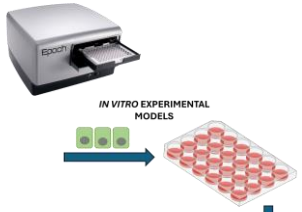
SPOKE 3

Multimethodological APPROACH TO EVALUATE CHEMICAL-BIOLOGICAL AND TOXICOLOGICAL HAZARDS (IMPROVING)



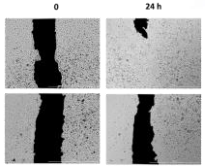
Non-cell-based in vitro assays

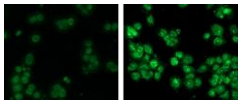
- Spectrophotometric analysis of polyphenolic compounds
- Enzyme inhibition (e.g., antinflammatory activity)
- Spectrophotometric and fluorometric assays (e.g., radical scavenging, chelating, reducing and antiglycative activity)

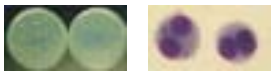


Cell-based in vitro assays

- Modulation of cell parameters (viability, cell cycle, apoptosis)
- Cytotoxicity/ tolerability studies after simulated digestion and metabolic activation
- Cytoprotection vs. pollutants and toxins
- ABC transporters modulation
- Cell migration and invasion
- Live cell analysis
- Cell Imaging and immunofluorescence
- Intracellular oxidative stress
- Inflammatory factors
- Genotoxicity/genoprotection in bacterial and mammalian cells (micronuclei, γH2AX); in silico prediction







Expected Results

- Identification of chemical and biological hazards related to phytosanitary treatments, manufacturing processes, incorrect storage practices and (a)biotic stresses
- Development of customized nutraceuticals and functional food tailored to specific populations (e.g., patients with chronic conditions).
- Understanding the bioactive compounds and the functional power of foods and nutraceuticals.

Expected Impact

- **Safe innovation:** development of safe, high-quality, and effective foods and nutraceuticals.
- **Environment:** reduced impact of food and nutraceutical industries though the adoption of ecofriendly practices.
- **Public health protection:** reduced risks of contaminants.
- **Scientific advancement:** driving forward advanced knowledge and innovation to tackle global challenges and enhance quality of life.

Stakeholders

- **Academic and research institutions**: networking opportunities and multidisciplinary collaboration.
- **Food and nutraceutical companies:** support to develop innovative products in compliance with safety standards.
- **Agricultural producers and technology providers:** improved farming practices, implementation of innovative tools and systems and enhanced market competitiveness.
- **Public Institutions:** reduced healthcare costs associated with risks arising from food contamination.
- **Consumers:** access to safer, better-quality foods and health-enhancing nutraceuticals

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Useful Contacts

For further information or collaboration opportunities

SPOKE 3 → **Antonella Di Sotto**

antonella.disotto@uniroma1.it

Dipartimento di Fisiologia e Farmacologia Vittorio Erspamer

SPOKE 4 → **Annabella Vitalone**

annabella.vitalone@uniroma1.it

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Ministero dell'Università e della Ricerca

Italiadomani Piano Nazionale di Ripresa e Resilienza

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Iniziative PNRR nella Facoltà di Farmacia e Medicina.

PE10 - ONFOODS "Modelli per un'alimentazione sostenibile"-

Spoke 3- Food Safety of Traditional and Novel Foods /

Dip. Chimica e Tecnologie del Farmaco/

Prof. **Maria Elisa Crestoni**

Foto: Stefania Sepulcri (Stampa e comunicazione)

- **Contributo del Dipartimento:**
  Evaluation of new, and (re)emerging risks in the food system and development of strategies for ensuring the safety and healtiness of food.
- **Obiettivi specifici**:

  - Identification and characterization of new and (re)-emerging hazards in traditional food products;
  - Integrated methodologies for risk assessment and risk-benefit assessment of novel foods;
  - Characterization of new/existing food packaging materials/systems (in collaboration with Dip. di Ingegneria Chimica Materiali Ambiente)
- **Risultati attesi in linea con i pilastri del PNRR**:

  - identification of chemical and biological hazards related to phytosanitary treatments, manufacturing processes, uncorrect storage practices and (a)biotic stresses determined by advanced untargeted NMR and MS-based metabolomic methods along with targeted HPLC-PDA/MS techniques.
- **Impatto previsto:** - strategies for risk reduction using innovative sustainable solutions; - omics protocols for risk assessment of traditional and novel foods; - rapid green and sustainable methods and strategies to evaluate the safety and traceability of traditional and novel food products; food waste recovery.

Beneficiari: Main stakeholders (consumers, partner companies, public bodies (Ministero della Salute, Mipaaf-Politiche agricole)

- **Contatti utili:** mariaelisa.crestoni@uniroma1.it cinzia.ingallina@uniroma1.it valeria.vergine@uniroma1.it

State of Art and Proposed Innovation

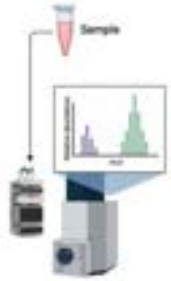
Food production is constantly expanding: a comprehensive quality control system is required to monitor each step of the chain.

Vegetables belong to a food category extremely exposed to safety risks for the presence of chemical residuals, like pesticides and microbial contaminants.

Develop analytical protocols to maximize metabolome coverage and identify (potentially) harmful compounds from sanitary and production treatments: application of **innovative analytical methods, i.e.** FT-ICR-MS, HPLC-MS/MS, and NMR for the assessment of **food safety and genuineness.**

FT-ICR Mass Spectrometer

Jeol NMR operating at 600 MHz



HPLC-MS/MS

MULTIMETHODOLOGICAL APPROACH TO EVALUATE CHEMICAL-BIOLOGICAL AND TOXICOLOGICAL HAZARDS (IMPROVING)

PARTNERS

- Dip. Chimica e Tecnologie del Farmaco
(M. E. Crestoni, C. Ingallina, V. Vergine)
- Dip. Chimica
(A. Gentili)
- Dip. Ingegneria Chimica, Materiali, Ambiente
(P. Russo, G. Adiletta, M. Valente)
- Dip. Biologia Ambientale
(M. Reverberi, L. Faino)
- Dip. Fisiologia e Farmacologia
(S. Di Giacomo, A. Di Sotto)
- Dip. Management
(M. Ruggeri)

massa critica

Projects:

1) Fresh-cut Golden Delicious apples
2) Riccio Tomato
3) Ni-free Tomato
4) R201® Kissabel apple
5) Modì ® apple

Research Projects and Achieved Results

1) Fresh-cut Golden Delicious apples

in collaboration with Dip. Ingegneria Chimica Materiali Ambiente

• Effect of **two biodegradable packaging** materials on the quality and safety of fresh-cut conventional apples («Melinda» Golden Delicious) during cold storage (21 days, 5 °C) in comparison with conventional polyethylene (LDPE) film.

2) Riccio Tomato ecotype

• Full chemical characterization of *Riccio tomato*, an old tomato variety relaunched by "La Sbecciatrice" and adapted to hilly land with marked resistance to drought and cryptogamic diseases.
The food supply chain, from production to retail, has been controlled by analyzing: whole tomatoes (T), tomato sauce (TS), and tomato waste (TW).

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PE10 - ONFOODS “Modelli per un’alimentazione sostenibile”

Spoke 4 – Food Quality and Nutrition

Dr. **Giacomo Di Matteo**

Foto: Stefania Sepulcri (Stampa e comunicazione)

Contents:

- Department contribution:
  • Chemical characterization of foodstuffs

- ONFOODS Projects and goals:
  • FERMENT_AGES: Development of analytical protocol for fermented beverages production
  • VEG-FRU_GAP: Chemical characterization of foodstuffs during the gastrointestinal progression
  • EDINMET: Chemical characterization of different edible insects

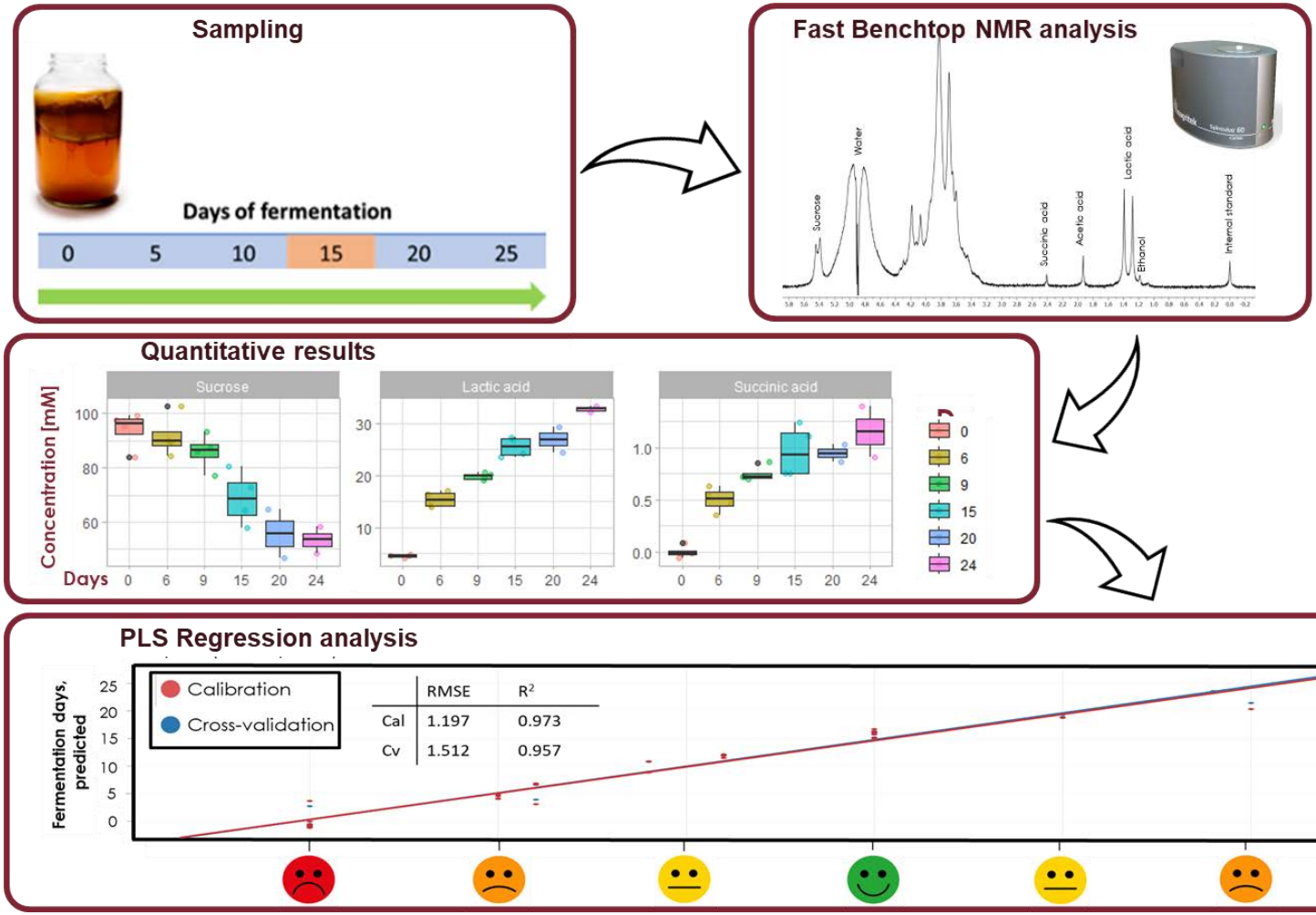
- Pillars of the PNRR ONFOODS Spoke 4 Project:
  • WP4.1. Product and Process Innovation
  • WP4.2. Product characterization by advanced analytical approaches
  • WP4.4. Innovation in food design and scaling up

- Expected impact:
  • Boost local economies by providing small producers and industries with innovative, cost-effective analytical tools and insights for product development.
  • Foster global market expansion for innovative food products like fermented beverages and edible insects, creating new economic opportunities.
  • Improve public health through a better understanding of food digestion and nutritional profiles, encouraging healthier food choices.

- Beneficiaries: food companies, citizens

- Useful contacts:
  • Giacomo Di Matteo, giacomo.dimatteo@uniroma1.it
  • Luisa Mannina, luisa.mannina@uniroma1.it

FERMENTED_AGES Project



Dissemination activities:

- Oral presentation at the “Second Symposium for Young Chemists: Innovation and Sustainability” (Jun 24-28, 2024, Roma, Italy).
- Oral presentation at the “3rd Food Chemistry Conference” (Oct 10-12, 2023, Dresden Hilton, Germany).
- Oral presentation at the “50th National Congress on Magnetic Resonance” (Sep 6-8, 2023, Rome, Italy).

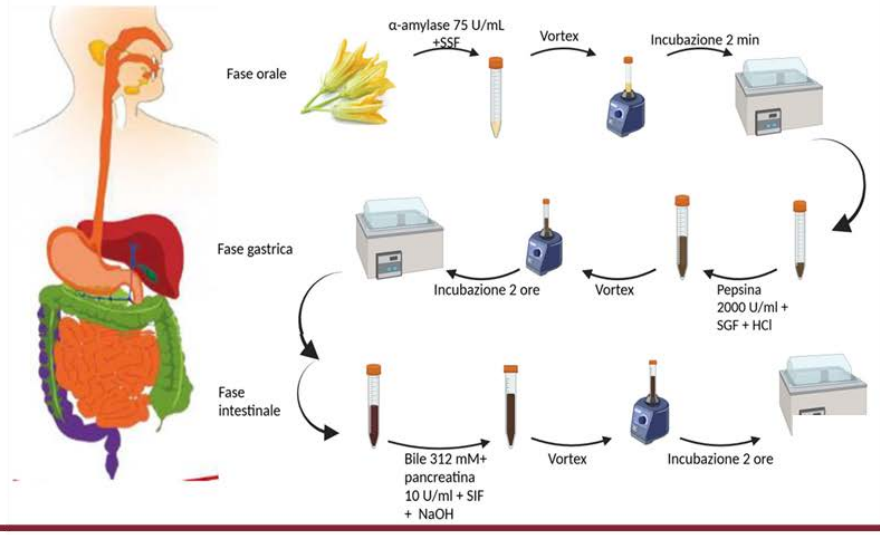
VEG-FRU_GAP Project

Sampling

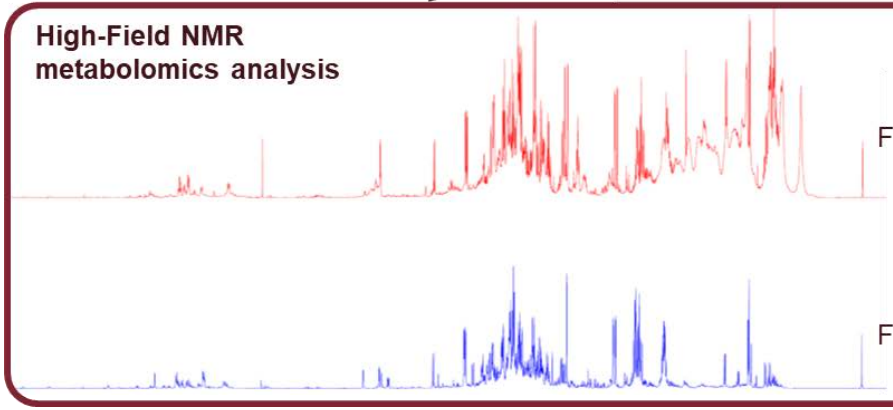
Family: Cucurbitaceae
Gender: *Cucurbita*
Species: *pepo*

Female inflorescences of zucchini

In vitro digestion (INFOGEST International Protocol)



High-Field NMR metabolomics analysis



Female inflorescences of zucchini before digestion

Female inflorescences of zucchini after digestion

Dissemination activities:

- Research article. Sergi R., et al. Macromol. Chem. Phys. (2023). 224, 2300098.
- Research article. Spano, M., et al. Journal of Agricultural and Food Chemistry. (2024). 72(40), 22258-22268.

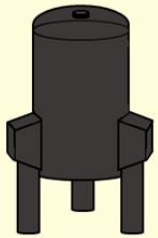
EDINMET Project

Edible insects

Submitted to

Different drying methods

High-Field NMR



- Amino acids
- Organic acids
- Polyols
- Nucleosides

GC-MS

- Fatty acids
- Volatile compounds
- Methyl branched alkanes

Improvement of edible insect-based formulations

Dissemination activities:

- Research article. Spano, M.; et al. Foods 2023, 12, 2331.
- Oral presentation at 4th MS-NatMedDay (Feb 15-16, 2024, Salerno, Italy).
- Oral presentation at VIII Workshop Applicazioni della Risonanza Magnetica nella Scienza degli Alimenti (June 20-21, 2024, Roma, Italy).
- Oral presentation at the Italian National Congress of Food Chemistry (ITACHEMFOOD) (May 29-31, 2023, Marsala, Italy)

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Dipartimento di Sanità Pubblica e Malattie Infettive

Project PNRR PE10 – ONFOOD «Research and Innovation Network on food and Nutrition Sustainability, Safety and Security – Working on Foods», "Models for sustainable nutrition"

Foto: Stefania Sepulcri (Stampa e comunicazione)

PE10_ONFOODS SPOKE 4 *Food quality and nutrition*

Acheta domesticus
(grillo domestico)

Immagine tratta dal WEB:
https://www.pieronuciari.it/wp/wp-content/uploads/2023/01/farina-di-grilli.jpg

Project EDINMET (Edible insects' characterization through untargeted and targeted methods)

Principal investigator: De Giusti M.*

Other partecipants: Tufi D.*, Fei G.*, Parrinello E.*, Mattera D.*, Tortoli D.* Di Monaco A.*

Immagine tratta dal WEB:
https://indonesian-recipes.com/download/2030-version.html

Project FERMENT_AGES (Fermented beverages studied by a metabolomics approach)

Principal investigator: De Giusti M.*

Other partecipants: Tufi D.*, Carlomagno L.*, De Santis A.*, Fei G.*, Di Monaco A.*, Ridolfo G.G.*, Tortoli D.*

Immagine tratta dal WEB (https://revolutionfermentation.com/fra/blogs/kbuchaombucha/histoire-kom)

AIMS

- ❑ To acquire new evidence on this NOVEL FOOD
- ❑ To evaluate the safety and the microbiological quality using the EC Regulations and scientific evidence data collected from the systematic review

Immagine tratta dal WEB (https://revolutionfermentation.com/fra/blogs/kbuchaombucha/histoire-kom)

METHODS

1_ SYSTEMATIC REVIEW

to acquire new evidence according to the Preferred Reporting Item for Systematic Reviews and Meta-analyses (PRISMA) statement databases Scopus, PubMed and Web of Science.

Project EDINMET

The Research string: ((edible[All Fields] AND (insecta[MeSH Terms] OR insect*[All Fields])) OR ("novel food*"[All Fields] OR entomophagy[All Fields] OR "insect powder"[All Fields]) AND "microbiological food safety"[All Fields] OR (((microbiologic*[All Fields] OR microbiological[All Fields]) AND safety[All Fields]) OR "food safety"[All Fields] OR "food safety"[MeSH Terms]) OR "microbiological contamination"[All Fields] OR "microbiological hazard"[All Fields]). **Inclusion ed exclusion criteria have been predetermined.**

Immagine tratta dal WEB (https://www.garzantispecialties.com/farine-di-insetto-alimentazione-umana/)

Project FERMENT_AGES

The Research string ("Kombucha" OR "kombucha drink*" OR "Kombucha tea" OR "Kombucha beverage") AND (("microbiologic*" OR "risk" OR "food microbiology" [MeSH Terms] OR "microbiological safety" OR " microbiological risk")). **Inclusion ed exclusion criteria have been predetermined**.

Immagine tratta dal WEB (https://culturesforhealth.com/blogs/learn/making-a-scoby-hotel-to-store-your-scoby)

PE10_ONFOODS SPOKE 4 *Food quality and nutrition*

onfoods
Research and Innovation for Sustainable Food and Nutrition

METHODS

2_ MICROBIOLOGICAL ANALYSIS

performed according to *EC Regulation and new scientific evidence.*

Quality and process hygiene indicators microbiological parameters according to standard cultural ISO methods

- ✓ Total Aerobic Mesophilic Count
- ✓ Total Yeast and Mould Count
- ✓ *Enterobacteriaceae*
- ✓ *Escherichia coli*

Safety of use descriptors food pathogen according to standard cultural ISO methods and also Real Time - LAMP (*Loop-Mediated Isothermal Amplification*) PLUS ONE* (ICGENE-Enbiotech kit (Avantech Group s.r.l.).

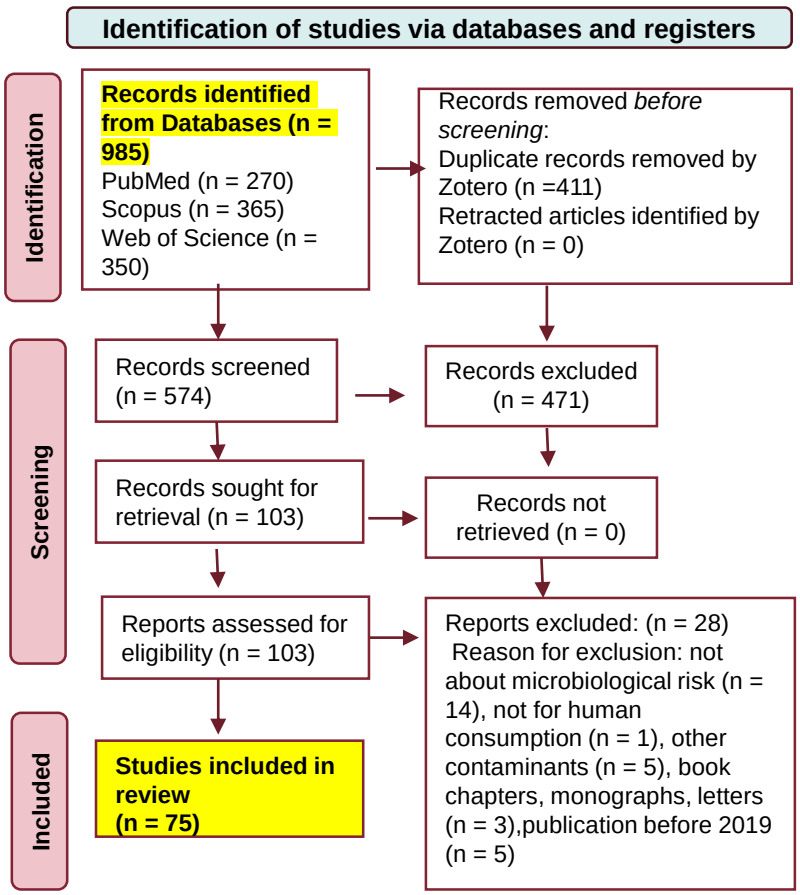
- ✓ *Salmonella* spp.*
- ✓ *Listeria monocytogenes**
- ✓ *Shiga-Toxin* (Stx1 and Stx2) producing *Escherichia coli* (STEC)*
- ✓ *Bacillus cereus* group
- ✓ *Cronobacter* spp.

Iniziative PNRR nella Facoltà di Farmacia e Medicina.
Rome Technopole, Centri Nazionali e Partenariati estesi

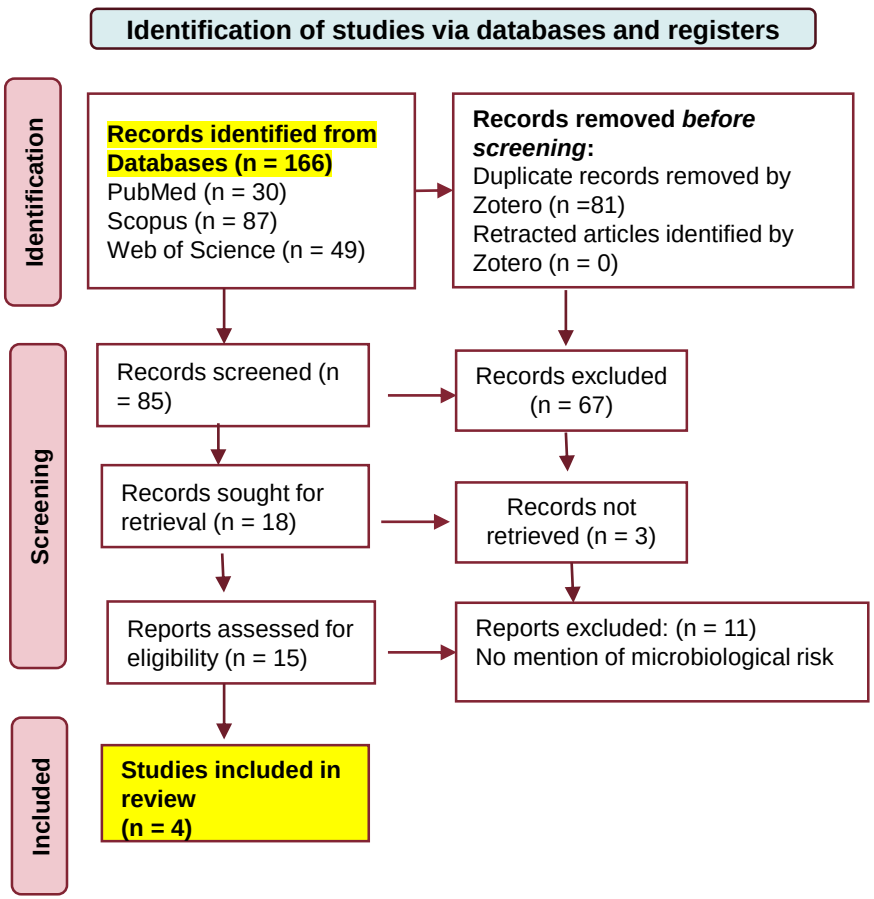
SAPIENZA UNIVERSITÀ DI ROMA
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA
Ministero dell'Università e della Ricerca
Finanziato dall'Unione europea NextGenerationEU

RESULTS: *Systematic Review*

Project EDINMET



Project FERMENT_AGES



onfoods Research and Innovation for Sustainable Food and Nutrition

Project EDINMET

RESULTS: *Microbiological Analysis*

A total of 4 samples of edible cricket: **n.2 adult** (n.1 freeze-dried adult and n.1 frozen -20° C) and **n. 2 *nymph*** (n.1 freeze-dried adult and n.1 frozen -20° C) were analyzed by ISO culture methods and by RT LAMP PLUS ONE

- **No evidence of pathogenic microorganisms** belonging to the genera *Salmonella* spp., *Cronobacter* spp. and *Listeria monocytogenes* and **no *Escherichia coli*** in any of the examined samples;
- **Presence of *Bacillus cereus group*** only in freeze-dried nymphs crickets sample;
- ***Enterobacteriaceae*** showed the highest rate in edible freeze-dried adult crickets sample (values of 1,5 x 10^5 CFU/g), while the lower value was found in edible freeze-dried nymphs crickets sample (6,7 x 10^4 CFU/g). Microorganisms isolated: *Citrobacter sedlakii, Klebsiella oxytoca, Klebsiella pneumoniae, Acinetobacter baumannii;*
- Count of **Total Aerobic Mesophilic** bacteria carried out in the 4 analyzed samples showed **hight maximum value of 3,6 x 10^9 CFU/g** in whole edible adult crickets sample while **the lower value** was found in whole edible nymphs crickets sample with a value of **4,1 x 10^7 CFU/g;**
- **Presence of Total Yeast and Mould Count** (∑ filamentous microfungi and yeasts) in all samples with **minimum values of 1,2 x 10^2 CFU/g** on whole edible adult crickets sample and **maximum values of 9,2 X 10^2 CFU/g** on edible freeze-dried adult crickets sample (mainly filamentous microfungi belonging to the genera *Penicillium* spp. *Cladosporium* spp., *Fusarium* spp.);
- Analyses carried out through RT-LAMP PLUS ONE are in progress.

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Project FERMENT_AGES

RESULTS: *Microbiological Analysis*

A total of 4 samples of **Kombucha tea**, purchassed from Commercial market (GDO and Bio Chain of Rome area) were analyzed:

- n.1 KARMA kombucha green tea sample (19349/AL);
- n.1 VOELKEL kombucha unpasteurized sample (19350/AL);
- n.1 VOELKEL raw kombucha raspberries and currants sample (19633/AL);
- n.1 OLD KOMBUCHA bio-organic ginger and lemon sample (19634/AL).

- **No evidence of pathogenic microorganisms** belonging to the genera *Salmonella* spp., *Cronobacter* spp. and *Listeria monocytogenes* and **no *Escherichia coli*** in any of the examined samples;
- **Presence of *Bacillus cereus group* in 2/4 samples examined** (19349/AL; 19350/AL);
- **Detection of *Enterobacteriaceae* in 2/4 samples examined** (19633/AL; 19634/AL) with minimum and maximum values found, respectively, of **1,7 x 10^8 CFU/g** (19634/AL) and **3,2 x 10^{10}** CFU/mL (19633/AL). Microorganisms isolated: *Klebsiella pneumoniae* (19633/AL, 19634/AL);
- Count of **Total Aerobic Mesophilic** bacteria ranged from minimum values of **4,1 x 10^3 CFU/g** (19350 AL) and maximum values of the order of **4,2 x 10^{10} CFU/mL** (19633 AL). Microorganisms isolated: *Leuconostoc pseudomesenteroides* and *Aeromonas salmonicida*;
- **Presence of Yeast-like fungi** in all samples with **minimum values of 2,2 x 10^3 CFU/g** (19349/AL) and **maximum values of 2,2 X 10^5 CFU/g** (19350/AL). **Always absent filamentous microfungi.**
- **The results obtained by RT LAMP PLUS** shows no evidence of DNA of *Salmonella* spp., *Listeria monocytogenes* and Shiga-Toxin type 1 and type 2 (Stx1 and Stx2) producing *Escherichia coli* (STEC) in 2 out of 4 examined samples (19349 AL; 19350 AL). Results confirmed by ISO methods.

GRAZIE PER L'ATTENZIONE

Finanziato dall'Unione europea NextGenerationEU
Ministero dell'Università e della Ricerca
Italiadomani PIANO NAZIONALE DI RIPRESA E RESILIENZA

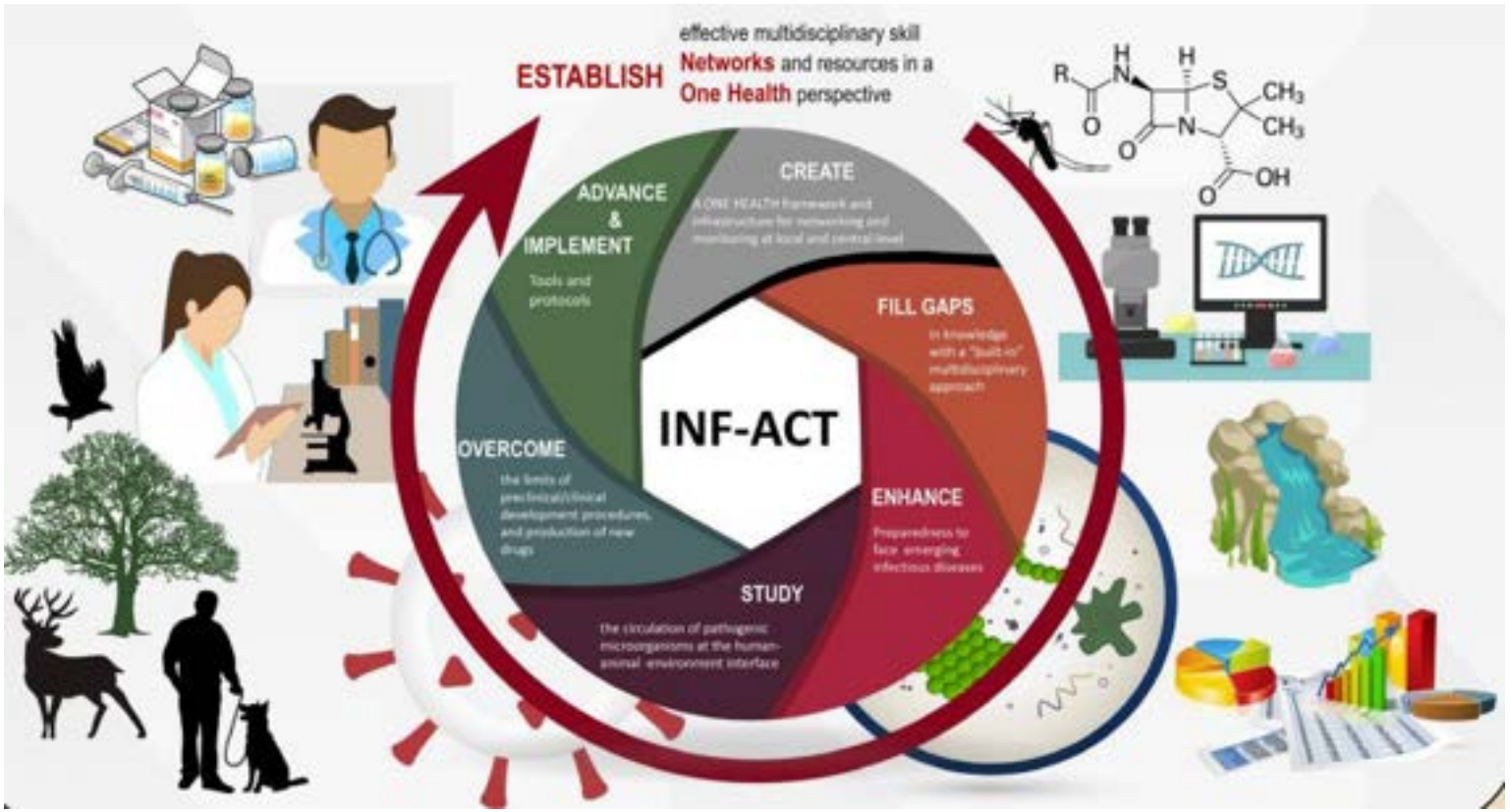
SAPIENZA
UNIVERSITÀ DI ROMA

PE13 - One Health Basic and Translational Research Actions addressing Unmet Needs on Emerging Infectious Diseases

Alessandra della Torre

Foto: Stefania Sepulcri (Stampa e comunicazione)

The **INF-ACT** research program addresses pressing **unmet needs of human emerging infectious diseases** in both fundamental and translational aspects in a **One-Health framework**



The **INF-ACT** research program addresses pressing **unmet needs of human emerging infectious diseases** in both fundamental and translational aspects in a **One-Health framework**

5 research nodes

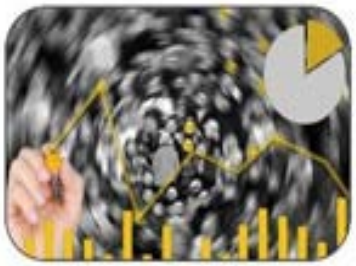
vertical nodes

Emerging and Re-emerging Viruses

Artrhopod Vectors and Vector-Borne Pathogens

Antimicrobial Resistance (AMR)

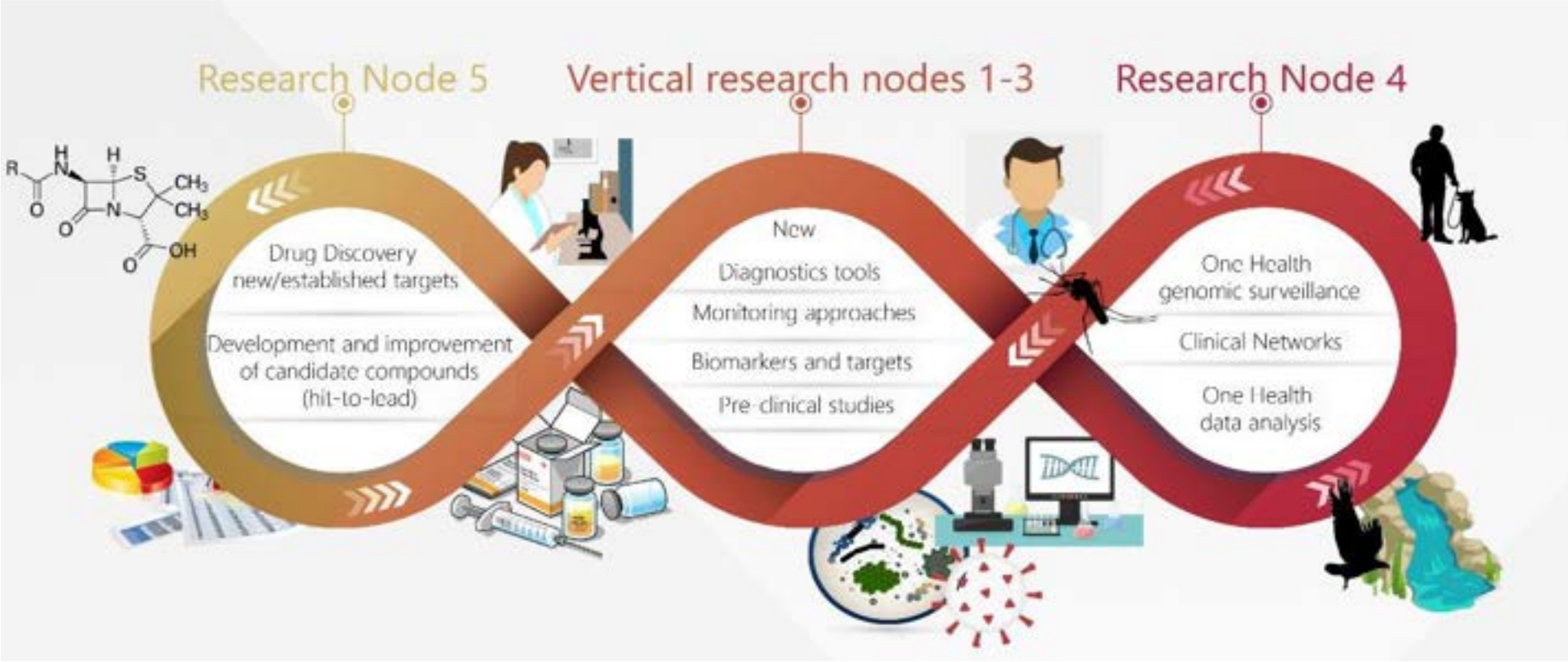
horizontal nodes



Epidemiology, Monitoring and Mathematical Models

New Therapeutic Strategies

The **INF-ACT** research program addresses pressing **unmet needs of human emerging infectious diseases** in both fundamental and translational aspects in a **One-Health framework**



Consiglio Nazionale delle Ricerche
UNIVERSITÀ DI PAVIA
ISTITUTO SUPERIORE DI SANITÀ

Emerging and re-emerging viral threats	Arthropod vectors and vector-borne pathogens	Antimicrobial resistance (AMR)	Epidemiology, monitoring and modelling	New therapeutic strategies
Fausto BALDANTI	Alessandra DELLA TORRE	Stefania STEFANI	Anna Teresa PALAMARA	Giovanni MAGA

vertical nodes


Emerging and Re-emerging Viruses


Artrhopod Vectors and Vector-Borne Pathogens


Antimicrobial Resistance (AMR)

horizontal nodes


Epidemiology, Monitoring and Mathematical Models


New Therapeutic Strategies

114.5 M€ total budget

350 tenured researchers

100 fixed-term researchers

25 Institutions

114.5 M€ total budget

350 tenured researchers

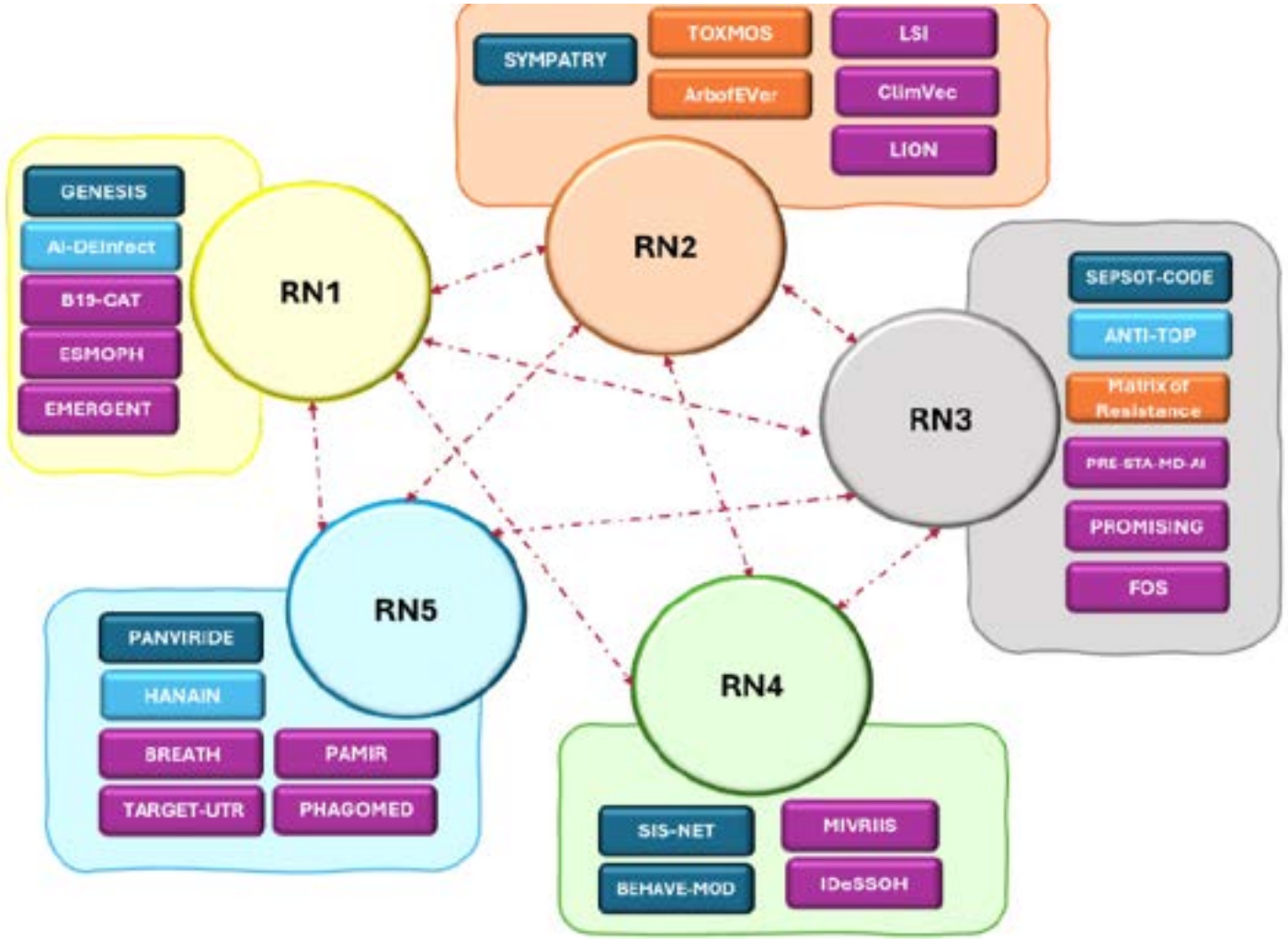
100 fixed-term researchers

62 Institutions

17.8 M€ cascade open calls

511 tenuered researchers

122 fixed-term researchers

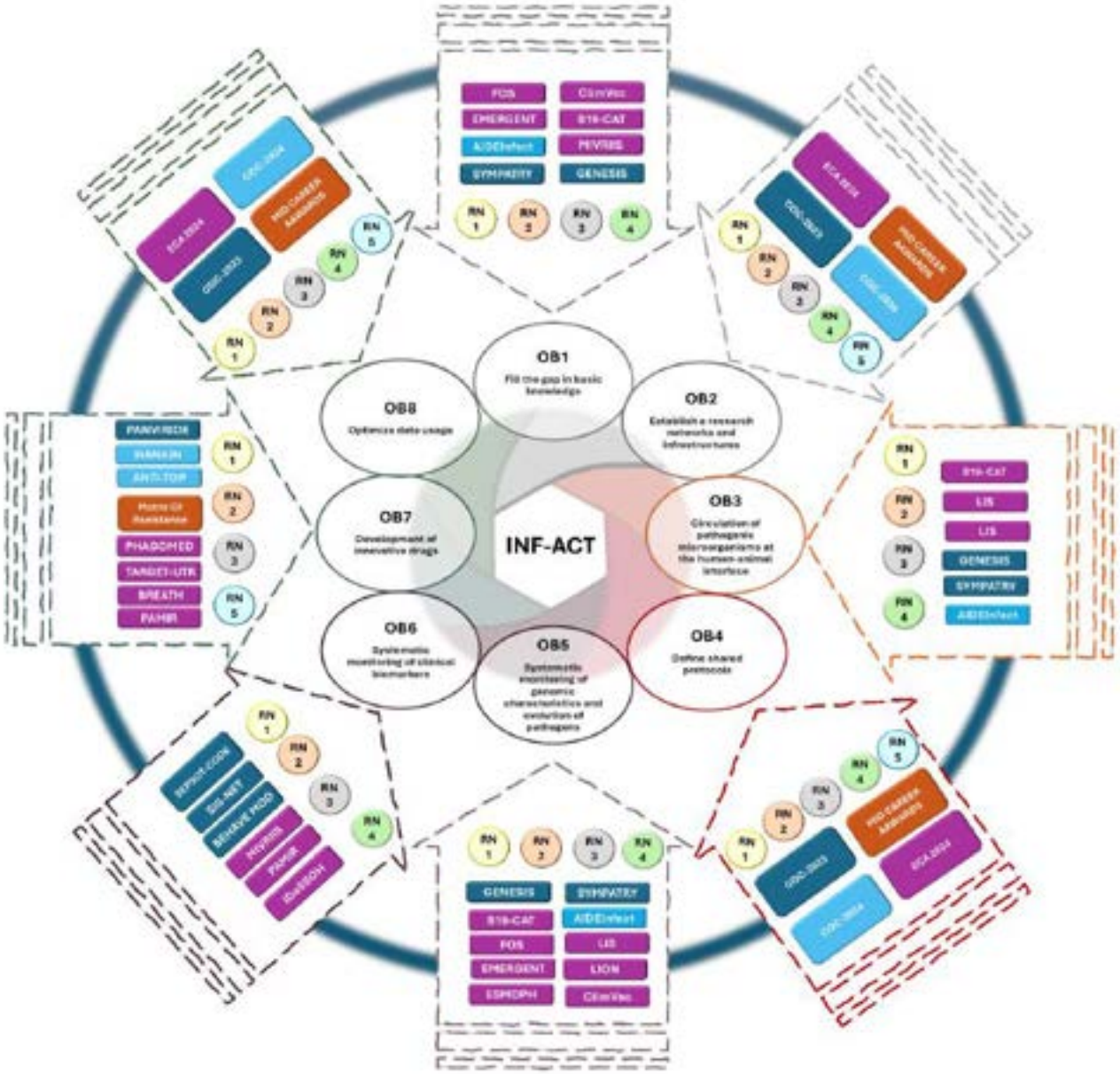


Legend

- COC-2023
- COC-2024
- Mid-Career Awards
- Early Career Awards

Objectives:

1. **fill gaps** in basic knowledge of the biological characteristics on highly diffusible pathogens and arthropod vectors with a "built-in" multidisciplinary *One Health* approach;
2. **establish effective multidisciplinary training and competence networks and technological research infrastructures** addressing emerging infectious diseases at the national level;
3. **study the circulation of pathogenic microorganisms at the human-animal interface** (both domestic and wild) and the risk of spillover events;
4. **define shared protocols** for the implementation of monitoring of and contrast measures against emerging infections through the development and application of innovative tools;
5. **create a framework for centralized systematic genomic surveillance** of pathogens and vectors with epidemic potential facilitating the identification of innovative biomarkers for rapid diagnostics;
6. **establish** a **network and infrastructure** for centralized systematic monitoring of clinical biomarkers;
7. **exploit** the accumulated fundamental and pre-clinical knowledge for the discovery and characterization of new small molecules for hit-to-lead optimization and **development of innovative drugs**;
8. **optimize data usage** from multiple sources for *One Health* early warning, risk assessment and for the prioritization of public health interventions to improve the country's overall preparedness towards potential emerging (and even re-emerging) infectious threats to public health.


INF-ACT
OB1
OB2
OB3
OB4
OB5
OB6
OB7
OB8
Legend
COC-2023
COC-2024
Mid-Career Awards
Early Career Awards

National PhD Program in *One Health approaches to infectious diseases and life science research*

UNIVERSITÀ DI PAVIA

Led by UNIPV, 20+ Institutions involved

>52 PhD fellows recruited in 2023 (XXXIX cycle)

33 new fellows started in October (XL cycle)

30+ positions available in 2025! (XLI cycle)

Consiglio Nazionale delle Ricerche
UNIVERSITÀ DI PAVIA
ISTITUTO SUPERIORE DI SANITÀ

Emerging and re-emerging viral threats
Coord. SAPIENZA
G Antonelli
(DMM)

Arthropod vectors and vector-borne pathogens
Coord. SAPIENZA
A della Torre
(DSPMI)

Antimicrobial resistance (AMR)
Coord. SAPIENZA
A Carattoli
(DMM)

Epidemiology, monitoring and modelling
Coord. SAPIENZA
C Mastroianni
(DSPMI)

New therapeutic strategies
Consiglio Nazionale delle Ricerche
Coord. SAPIENZA
R Di Santo
(DCTF)

4.720 K€ total budget

8 Departments (4 from F&M Faculty)

18 fixed-term researchers (14 from F&M Faculty)

5 tenured researchers (all from F&M Faculty)

GRAZIE per L'ATTENZIONE!

www.inf-act.it

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UNIVERSITÀ DI ROMA

Iniziative PNRR nella Facoltà di Farmacia e Medicina.

PE13 - One Health Basic and Translational Research Actions addressing Unmet Needs on Emerging Infectious Diseases

KEY CONCERNS after COVID-19**:**

Recent Outbreaks: Ebola, Zika, avian influenza, mpox, cholera, dengue fever, Oropouche fever, Marburg virus disease, and others.

Respiratory Viral Infections: among the leading global causes of mortality; a deeper understanding of host-pathogen interactions is essential; focus on research and developing effective/rapid diagnosis and interventions is necessary; new variants of viruses continue to show increased human-to-human transmissibility

PE13 Research Node 1 - Emerging and re-emerging viral threats
which includes 12 universities, 3 research hospitals, CNR and ISS, the Research Institute (IRFMN), and AIZS

PE13 – Infectious Diseases/SPOKE 1- Emerging and re-emerging viral threats/UNISAP

Spoke Leader: **Guido Antonelli** - Dept of Molecular Medicine

- **Gabriella D'Ettorre** - Dept of Public health and Infectious Diseases
- **Fabio Midulla** - Dept of Maternal, Infantile and Urological Sciences
- **Lucia Nencioni** - Dept of Public health and Infectious Diseases
- **Maurizio Sorice** - Dept of Experimental Medicine

PE13 – Infectious Diseases/SPOKE 1- UNISAP

MAJOR GOALS:

- Develop new diagnostic approaches to improve identification capabilities of clinical virology lab for emerging and re-emerging viruses.

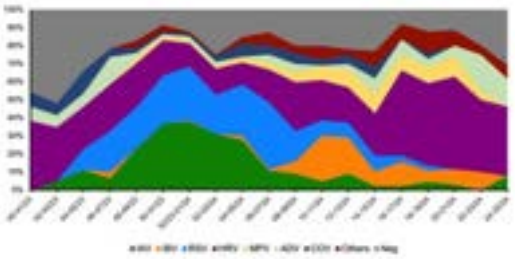
- Implement new diagnostic technologies in specific clinical settings to:
  - Improve the understanding the actual clinical impact of emerging and and re-emerging viral infections
  - Identify new markers for disease severity and progression
  - Develop effective intervention protocols

- Utilize virus isolation and culturing skills for:
  - In vitro testing of new antivirals (in collaboration with Research Node 5)

- Feed genotyping results into the genetic repository of Research Node 4 to support:
  - Epidemiological studies
  - Mathematical modeling of outbreaks

Task 1.1.1 New diagnostic approaches (immunological, antigenic, molecular, qualitative vs quantitative, syndromic vs single, and metagenomic) to detect viral infections [GA]

- Evaluation of existing immunological, antigenic, molecular diagnostic and home-made techniques. Novel tools/protocols for characterization of emerging viruses

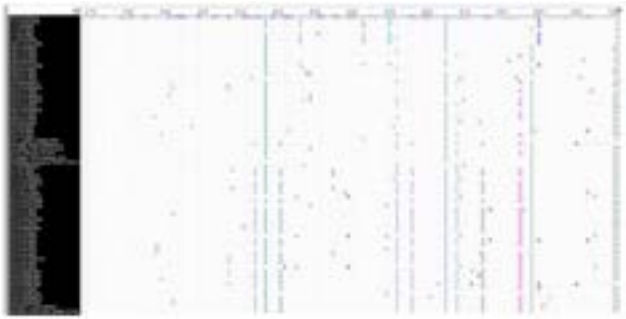


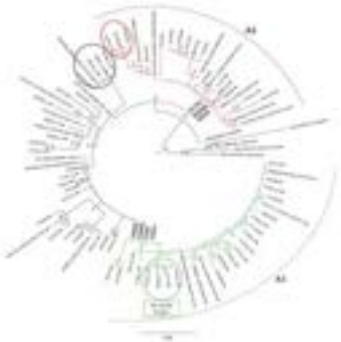
Task 1.1.2 Monitoring and genotyping of respiratory viruses in severe vs mild infections in pediatric patients. Role of coinfections [GA, FM]

- Molecular diagnosis of hundreds of pediatric samples, epidemiology and phylogenesis of respiratory viruses in the post-pandemic periods (Influenza, RSV, SARS-CoV-2 and other CoV, HRV, hMPV)

Task 1.1.3 Monitoring and genotyping of viruses in severe vs mild infections in immunocompetent and immunocompromised adults. Role of coinfections [GA]

- Molecular diagnosis of hundreds of adult patients with different clinical conditions: immunocompetent, HIV-positive and other immunodeficiencies. Genotyping of respiratory viruses in adults compared with pediatric samples.

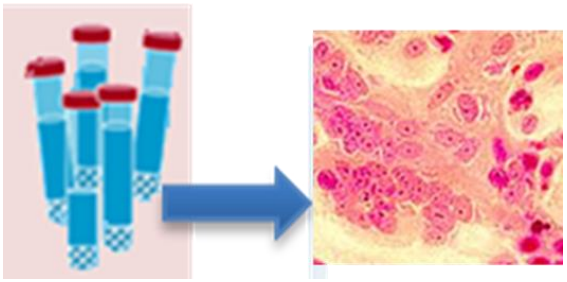


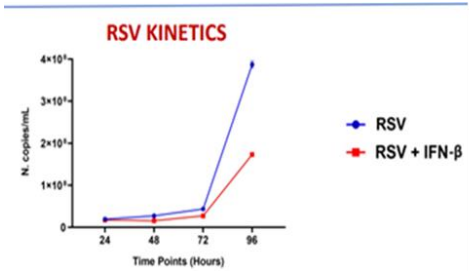


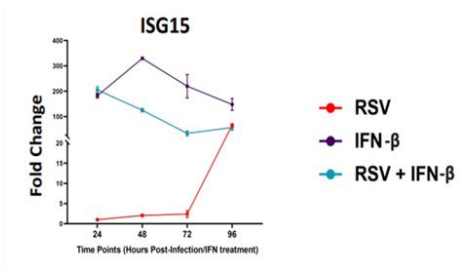
WP 1.2: Virus-Host interactions and virus Immunoediting

Task 1.2.2 Protective as well as pathogenetic innate immune responses [GA, FM, GDE]

-Evaluate the role of extracellular and intracellular factors of innate immune pathways and mechanisms of evasion of antiviral immune response, such as interferons (IFN). To measure the detrimental effects of inappropriate, excessive, or mistimed IFN responses in viral infections, measuring the transcriptional kinetics and protein levels in respiratory samples. Ex Vivo studies at the level of mucosal surfaces







WP1.4: Clinical manifestations of emerging and re-emerging viruses, and assessment of vaccines and treatments efficacy

Task 1.4.3 Assessment of humoral and cellular responses to vaccine(s) to correlate protection from infections or disease [GA, FM, GDE]

- Identification of protective cellular responses against viral proteins will be evaluated through the measurements of immune cell patterns (CD4 and CD8 T cell subsets, B lymphocytes), by multiparametric flow cytometry analysis, and the association to the disease severity.
- The specific role of humoral immune responses through measuring the levels of anti-viral IgG and neutralizing Ab).

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PE13 - INF-ACT Research Node 2 "*Arthropod vectors and arthropod-borne diseases*"

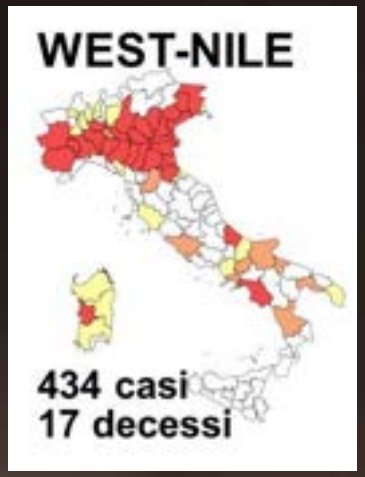
Alessandra della Torre

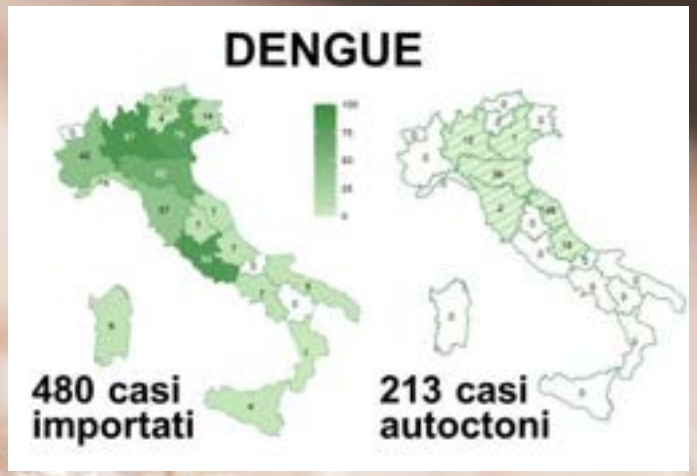
Foto: Stefania Sepulcri (Stampa e comunicazione)

INF-ACT RESEARCH NODE 2:

Vettori Artropodi e Patogeni Trasmessi da Vettori

2024





INF-ACT RESEARCH NODE 2

WP1 – DEL 1.1 Standard protocols

WP1- Deepening knowledge on vector's bionomics, multi-omics and vector-host-pathogen interactions

WP2 - Development and implementation of conventional and innovative surveillance approaches for vector monitoring

WP2 – DEL 2.1 novel tools for vector and VBP monitoring

WP3- Contextualization of vector distribution, bionomics, taxonomy, multi-omics and population structure to enable country-wide meta-analyses

WP3 – DEL3.1 Vector BioBank

WP3 – DEL3.2 Relational vector database for national-wide meta-analyses

RN4 EPIDEMIOLOGY

WP4 - Development and validation of vector control approaches

WP4 – DEL 4.1 Validated innovative vector control approaches

PH and private Sector

WP5 - VBP pathogenesis, diagnostics, therapeutic targets and surveillance in human hosts

WP5 – DEL 5.1 Novel diagnostics

WP5 - DEL 5.3 Novel microbes in vectors

WP5 - DEL 5.2 Novel therapeutic targets

RN5: DRUGS

RN2 WP2.1 - Deepening knowledge on vector's bionomics and vector-host-pathogen interactions

ale.dellatorre@uniroma1.it; beniamino.caputo@uniroma1.it; verena.pichler@uniroma1.it (RTD-A INF-ACT)

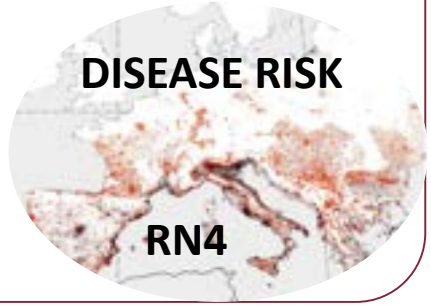
Task 2.1.1 - Analysis of vector's bionomical, ecological, physiological, behavioral factors affecting epidemiology of mosquito-borne diseases

Abundance

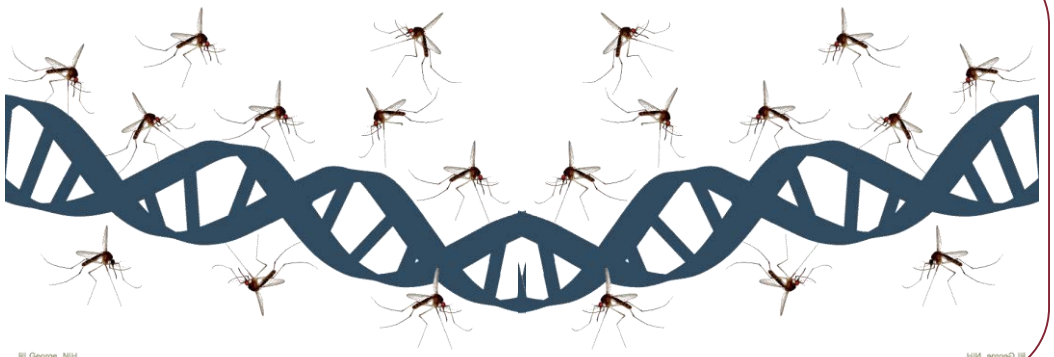
Survival

Host-choice

Dispersal



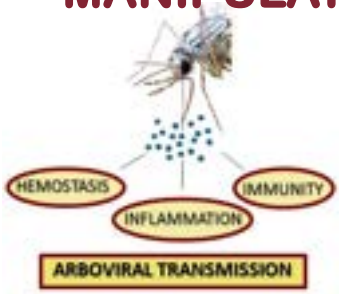
Task 2.1.3 – Vector genomics, ecological genomics, invasion/adaptation genomics



RN2 WP2.2 - Development and implementation of conventional and innovative approaches for vector and VBD monitoring and surveillance

Task 2.2.3 - ROLE OF MOSQUITO SALIVARY PROTEINS AND miRNAs IN HOST MANIPULATION & PATHOGEN TRANSMISSION

bruno.arca@uniroma1.it



- Development of markers of exposure to *Aedes* bites based on mosquito salivary antigens
- Characterization of exosome microvesicles
- Transcriptional profiling of salivary glands and midgut) *Aedes koreicus*

Task 2.2.4 - UNDERSTANDING INSECTICIDE RESISTANCE MECHANISMS IN MOSQUITO, TICK AND SAND FLY VECTORS.

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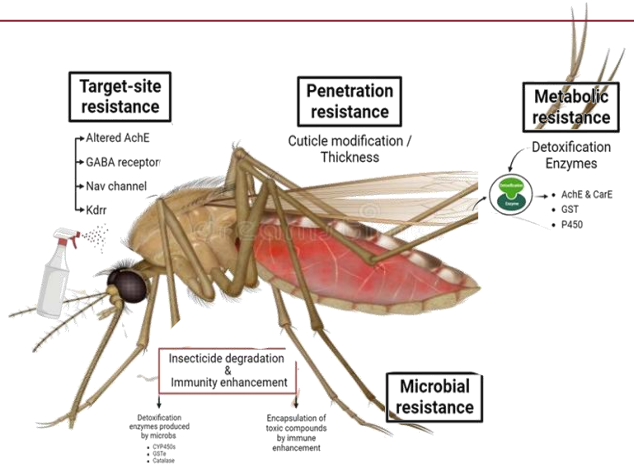
verena.pichler@uniroma1.it (RTD-A INF-ACT)



RN2 WP2.3 - Creating open-source resources to enable country-wide meta-analyses and predictions on vectors and VBPs

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beniamino.caputo@uniroma1.it

RN2 WP2.4 - Development and validation of vector eco-friendly control approaches

Task 2.4.2 - Development of tools for assessment of innovative vector control approaches

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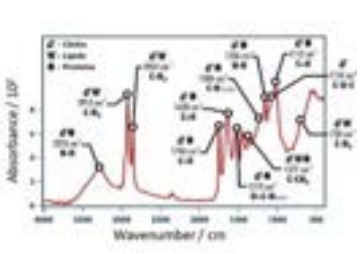
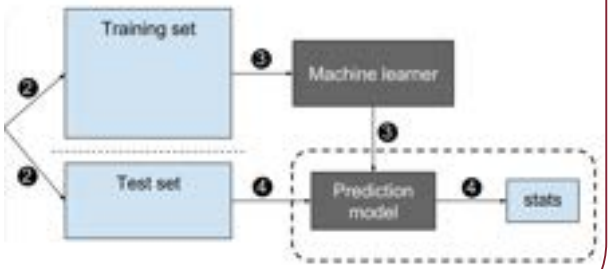
Development of Midi-Infrared Spectrometry and Machine learning approach for mosquito age-grading





Task 2.4.4 - Development and validation of genetic technologies for bio-control of adult mosquito vectors

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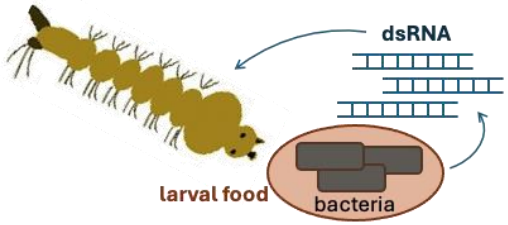

Bacteria expressing dsRNA inducing target-specific RNAi-mediated gene silencing

Development of genetic and molecular approaches based on RNA interference for the control of larval and adult mosquito stages

RN2 WP2.5 - VBP pathogenesis, diagnostics, therapeutic targets in human hosts

COMPREHENSIVE EVALUATION OF THE IFN RESPONSE IN ARBOVIRUSES

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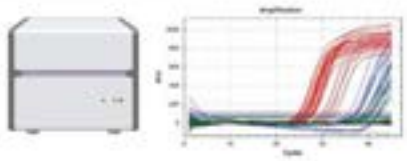
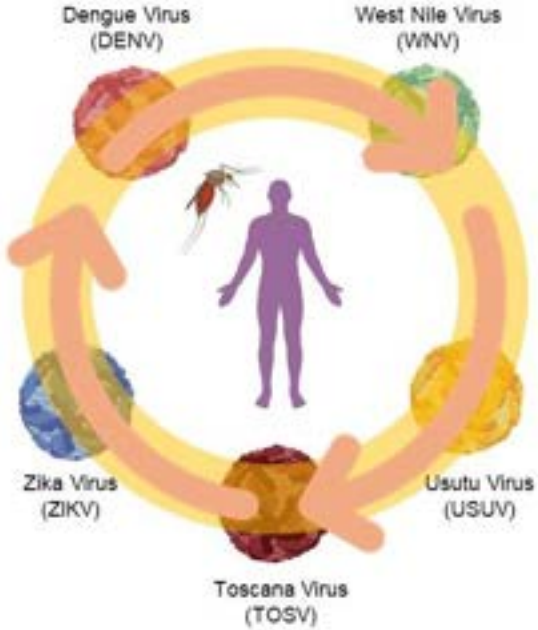
federica.frasca@uniroma1.it (RTD-A INF-ACT)

Assesment of the IFN signature

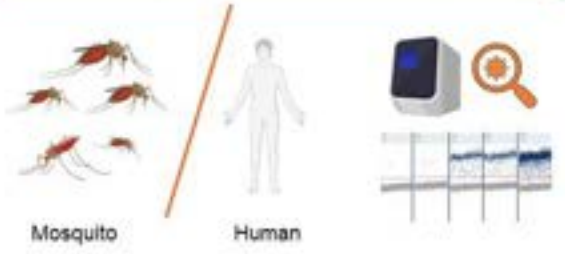


Detection of Neutralizing Auto-Abs (NAB) against IFN-I/-III



Evaluation of the expression of cellular non-coding RNAs (ncRNAs) related to the IFN pathway and viral ncRNAs

Development of diagnostic tests through digital PCR technology



Grazie per l'attenzione!

RN2 3rd-meeting (Bari, March 2024)

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Iniziative PNRR nella Facoltà di Farmacia e Medicina.

PE13 InfAct Spoke 3

Antimicrobial resistance (AMR)

Foto: Stefania Sepulcri (Stampa e comunicazione)

Antimicrobial Resistance

RESEARCH NODE 3 (Spoke 3) Coordinatore nazionale Università di Catania, Prof.ssa Stefania Stefani

Spoke affiliates: UniCT (10), UniBO (7), UniPV (3), CNR (2), UniSI (4), UniCA (2), UniPD (2), UniSAP (3), UniMI (4), UniNA (4), UniBA (3), UniTO (3), ISS (2), AIZS (8), HUNIMED (6), IRFMN (3), OPBG (3), UCSC (5), ISMETT (2), FPCBM (4)

WP3.1: Genomics, transcriptomics, mobilomics in MDR bacteria - One Health perspective
Dip. Medicina Molecolare- Prof.ssa Alessandra Carattoli

WP3.2: Preclinical translational models and studies of microorganism, human and environment correlation (Infectome)

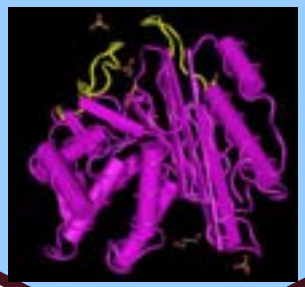
WP3.3: Molecular monitoring of resistance genes and commonly associated bacterial species; preparation of microorganism-specific multigene panels for clinical, animal, and environmental matrices

WP3.4: Non-conventional and alternative approaches to find new anti MDRO strategies and/or as adjuvant of already existing antibiotics
Dip. Scienze Biochimiche- Prof.ssa Maria Luisa Mangoni
Dip. Sanità Pubblica e Malattie Infettive- Dott.ssa Alessandra Oliva

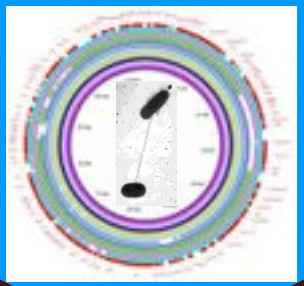
WP3.5: Clinical relevance of "Target and Tailored" therapies
Dip. Sanità Pubblica e Malattie Infettive- Dott.ssa Alessandra Oliva

Obiettivi specifici

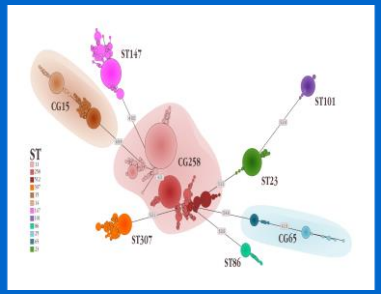
Novel AMR mechanisms



Horizontal AMR gene transfer



Molecular epidemiology



Dipartimento di Medicina Molecolare

Prof. Alessandra Carattoli, Leader WP 3.1

- **Task 3.1.1 Application of *omic* sciences (genomics, transcriptomics, mobilomics) to MDR bacteria characterization**
- **Task 3.1.2 Bioinformatics analysis** to (i) assess raw data quality, (ii) perform hybrid genome assembly, (iii) align reads to a reference, (iv) assess genome completeness scores
- **Task 3.1.3 Genomic and molecular epidemiology of resistance-associated genes**
- **Task 3.1.4** Feeding of a repository (Spoke 4) with a **curated catalog of bacterial genomes, virulence and resistance genes** associated to lineages and genomes

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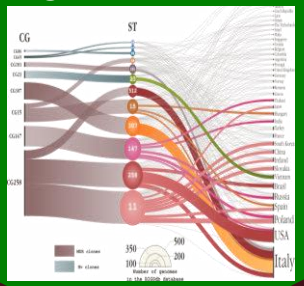
Impatto previsto

- Genome Network organization of ESKAPE in a **One Health vision** ; preclinical translational model and innovative diagnostics, clinical platforms and nonconventional therapeutic approaches
- Setting up **a national curated catalog of bacterial genomes**, virulence and resistance genes associated to lineages and genomes
- Contribution to identification of novel tools for the public health **preparedness and response in the context of the ongoing emerging** infectious diseases and/or future outbreaks of MDR organisms

New targets for AMR diagnosis

Evolutive trajectories of AMR bacteria

Genomic repository of high-risk clones



Risultati attesi in linea con i pilastri del PNRR

- **Success in limiting the emerging infectious diseases**, expected to have beneficial impacts for research, health-related issues, economics and social aspect
- **Significant impact on global health**, both at the individual and the public health level by leading to results that have a direct impact for persons at risk of exposure to AMR bacterial infections.

Contatti utili: Informazioni per chi volesse approfondire o collaborare

Prof. Alessandra Carattoli

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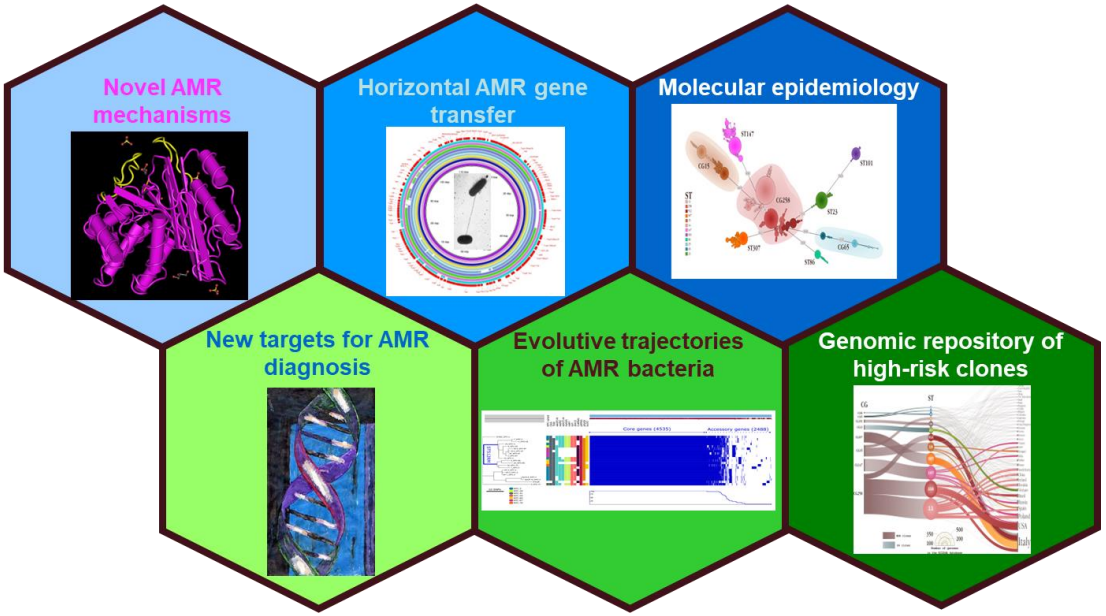

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PE13 INF-ACT (One Health Basic and Translational Research Actions addressing Unmet Needs on Emerging Infectious Diseases) SPOKE 3_Dip. Scienze Biochimiche_Mangoni

INF-ACT Spoke 3 WP 4

CONTRIBUTION OF DEPARTMENT OF BIOCHEMICAL SCIENCES "A. Rossi Fanelli"

Development of alternative approaches for new antimicrobial therapies and/or adjuvants of existing antibiotics to:

- Eliminate drug-resistant microorganisms
- Eradicate biofilms
- Promote repair of damaged tissues

Dip. Scienze Biochimiche A. Rossi Fanelli

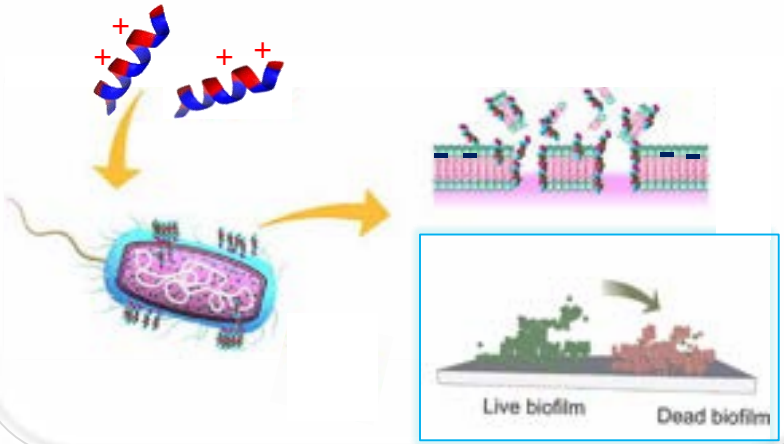
Internal Collaborators

Dr. B. Casciaro
Dr. D. Al Ismail
Dr. E. Grisard
Dr. F. Cappiello
Prof. M. Luisa Mangoni

Challenges

WHO: 10 million deaths/year by 2050, globally

✓ **Antimicrobial peptides AMPs:** promising new anti-infective agents



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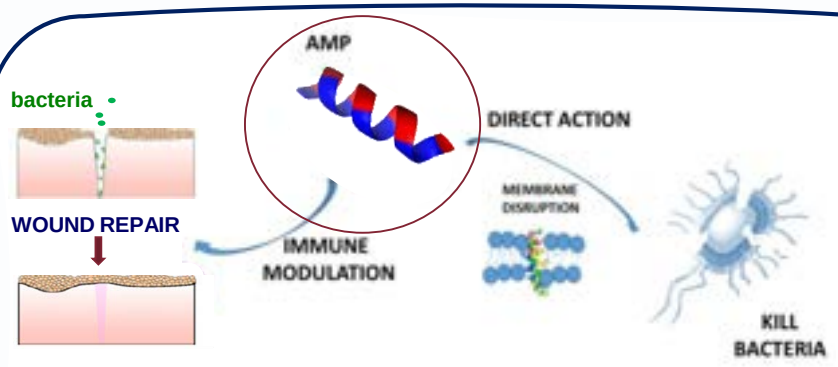
OBJECTIVES

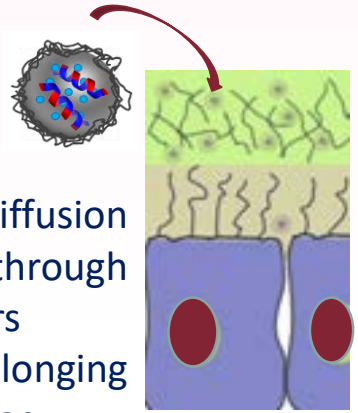
Department of Biochemical Sciences "A. Rossi Fanelli"



- **3.4.5 Development of multifunctional AMPs against multi-drug resistant (MDR) bacteria** that cause skin, pulmonary, ocular infections …

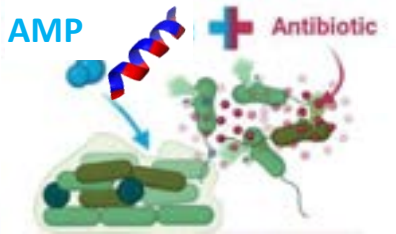
- **3.4.6. Evaluation of delivery systems**

Polymeric nanoparticles for:



- Assisting the diffusion of AMPs through biological barriers
- Enhancing & prolonging therapeutic efficacy

-3.4.7. Innovative strategies based on AMP in combination with traditional antibiotics



- Re-evaluate the activity of antibiotics and their use in combination with other compounds

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OBJECTIVES & EXPECTED RESULTS

Pipeline for the identification of new multifunctional antibacterial agents

MOLECULES

Membranolytic AMPs from amphibin skin

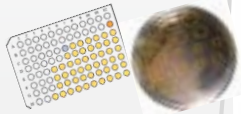
STRAINS

MDR bacteria

In collaboration with ***Dip. Sanità Pubblica e Malattie Infettive (WP3.5)*** & ***Dip. Medicina Molecolare (WP3.1)***

SELECTION OF HIT COMPOUNDS & ANTIMICROBIAL CHARACTERIZATION

- Antimicrobial activity



Mechanism of action:

"HITS" OPTIMIZATION

Synthesis of analogs by strategic amino acids substitution

WOUND HEALING STUDIES

(on human fibroblasts)

Cell migration studies

Formulations

EXPECTED RESULTS

The identification of:

- new therapeutic agents or adjuvants for MDR bacteria and promoting wound healing;
- skin-level delivery systems

In line with PNRR pillars:

Mission 1. Innovation (biomedical innovations, technological transfer, and collaborations between universities and industries)

Mission 2. Green and Ecological transition (reduction of environmental pollution)

Mission 6. Health (counteracting resistant infection)

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IMPACT

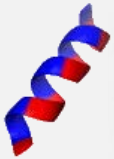
Good potential to bring benefits on many fronts

Society

✓ Better information on the importance of antibiotic resistance and the properties of AMPs.

Economy

✓ Reduction of AMPs effective doses, with targeted delivery and controlled release in biocompatible systems. Reduction of pharmaceutical development costs.



Environment

✓ Reduction of environmental pollution. AMPs are degradable into harmless products. Synthesis of AMPs with green technologies.

BENEFICIARIES:

Research institutes/Universities; **Companies**; **Citizens**

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PE 13 INF-ACT

One Health Basic and Translational Research Actions addressing Unmet Needs on Emerging Infectious Diseases

Foto: Stefania Sepulcri (Stampa e comunicazione)

SPOKE 4

Dip. Sanità Pubblica e Malattie Infettive

Coordinamento Claudio Mastroianni

WP 4.2 Clinical Networks for the identification of clinical and diagnostic markers and immunological monitoring

- **Task 4.2.1**. Clinical markers of disease in adults;
- **Task 4.2.3.** Gender markers of modulation;
- **Task 4.2.4.** Immunological monitoring;
  - **Sex and gender differences in nosocomial colonization/infection by antibiotic resistant bacteria**
  - **Immunologic biomarkers useful for diagnosis, prognosis and prediction of response to treatment for emerging and riemerging respiratory e virus infections;**
  - ***C. Mastroianni, A. Oliva, L. Santinelli***

WP 4.4.2: Human response to outbreaks

- **Task 4.4.2**. **Human behaviour during epidemics and timely data collection** ***(Corrado De Vito)***

Gender and sex differences in critically ill patients with rectal colonization sustained by carbapenem-resistant *Acinetobacter baumanii* and *K. pneumoniae*

Objectives

To evaluate sex-differences in female and male patients hospitalized in ICU and with rectal colonization due to carbapenem-resistant A. baumannii (CRAB) and KPC-producing K. pneumoniae (KPC-Kp)

To evaluate whether sex and/or gender influence the risk and the time to develop bloodstream infection (BSI)

Expected results

We expect that there is difference between male and female in the risk of developing BSI and in the time from colonization to infection, even after stratifying patients according to age classes

If sex/gender and/or age influence the risk or the time to develop BSI, preventive measures or higher clinical suspicion specifically targeting at the identified population at risk could either prevent BSI development or delay its onset in critically patients with rectal colonization sustained by carbapenem-resistant *Acinetobacter baumanii* and *K. pneumoniae*

Future perspective

Analysis of sex/gender related biomarkers on a prospective cohort of patients with rectal colonization due to KPC-Kp and/or CRAB

Contact(s)

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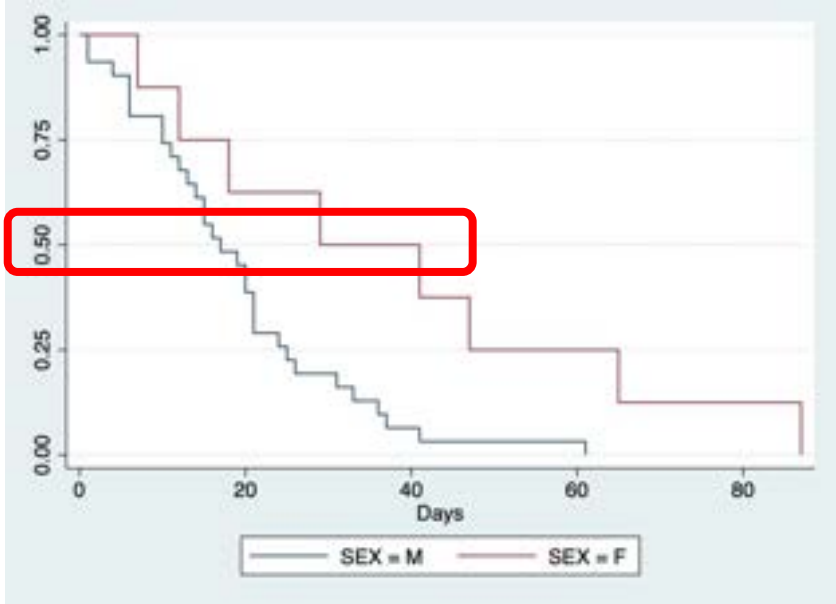
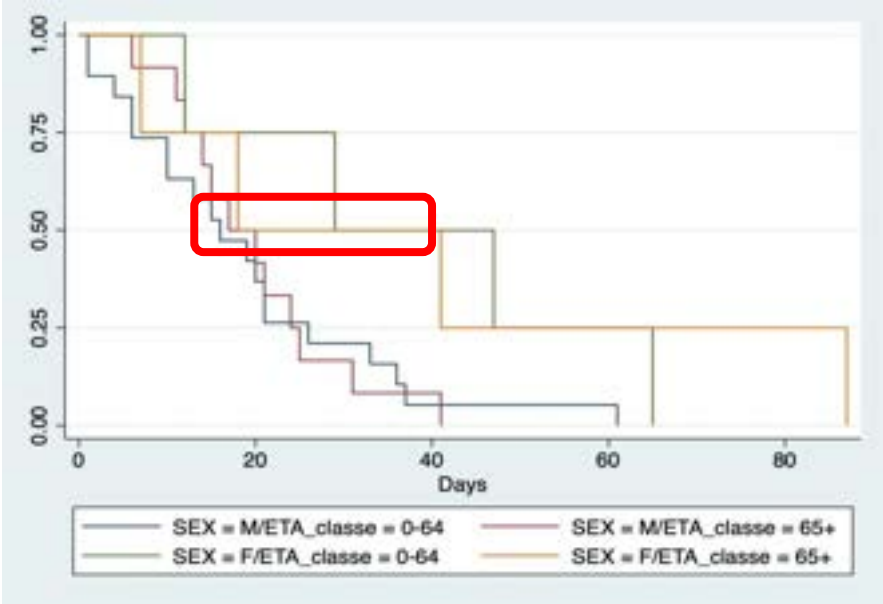
Longer time to develop BSI for female (red) than male (blu)



50% of men develops BSI after a median of 20 days, compared with 30 days of 50% female

Stratifying for age (< or > 65-y), longer time to develop BSI for female < 65-y (green)



50% of female >65-y develops BSI after a median of 20 days, 50% of female < 65-y after approx 30 days

Longer time to develop BSI from colonization in female, especially if age < 65 year, than male

We suggest to consider sex and age during ICU stay for a better patient management.

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❖ *Observational, retrospective, single-centre analysis of the prevalence of the most common seasonal respiratory viruses*

Evaluate the prevalence of the most common seasonal respiratory viruses at the Emergency and Infectious Diseases Departments examining the relationship between the respiratory viruses isolated and the clinical and demographic characteristics

100 subjects

55 male
45 female

64 (±20) y.o

Days of hospitalization: 10

Symptoms
- 43% pneumonia
- 29% Influenza-like illness
- 5% Acute respiratory failure
- 6% Fever

Prevalence of viral respiratory infections:
n=57 (57%)

FluA: 27%
RSV: 4%,
Rhinovirus : 3%
Flu B: 1%
SARS-CoV-2: 1%

❖ *Profile of cytokines and chemokines through automated immunoassay platform (in collaboration with ISS)*

Evaluate old and new soluble biomarkers to predict infection severity and response to treatment, defining gender/sex parameters and determinants of tissue damage

- IL-6
- IL-1β
- TNF-α
- IL-10
- IP-10
- CCL3
- IL-8
- CXCL10

	Males (n=60)	Females (n=43)	Mann Whitney test p-value
Age	61,5	63,0	
IL-1B (pg/mL)	0	0,0	0,8279
IL-10 (pg/mL)	0	0,0	0,9676
CXCL10 (pg/mL)	571	416,5	**0,045***
CCL3 (pg/mL)	24,1	21,6	0,2383
TNF ALPHA (pg/mL)	0,7	0,3	0,6017
IL-6 (pg/mL)	50,6	26,0	**0,006****
IL-8 (pg/mL)	20,9	19,8	0,6981

❖ *Understanding the relationships between the host immune responses and the distinct clinical presentations of COVID-19*

Evaluate host immune response to identify relevant surrogate markers defining the course of complex diseases and to characterize determinants of the post-acute sequelae of SARS-CoV-2 infection (Long COVID)

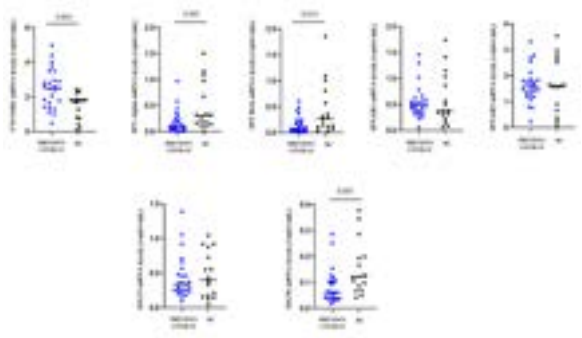
Evaluation of anti-IFN NABs among Long COVID subjects

GROUP A: Acute SARS-CoV-2 infection → **N=54**

GROUP B: One year after development of Long COVID→ **N=27**

- **3.7% (n=2)** of patients with acute SARS-CoV-2 infection tested positive for anti-IFN-α2, and anti-IFN-ω NABs (Group A)
- No association between Long COVID and the presence of Anti-IFN antibodies was observed within our study group after one year from post acute SARS-CoV-2 infection sequelae.

Association between Long COVID development and dysregulation of type I IFN response



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Task 4.4.2 – Human behaviour during epidemics and timely data collection

1. Analisi della *vaccine hesitancy* nei confronti dei vaccini anti-HPV e antinfluenzale

Studio **cross-sectional** per valutare il livello di *vaccine hesitancy* nella popolazione generale nei confronti dei vaccini anti-HPV e antinfluenzale.

Web-survey diffusa da un panel provider accreditato.
Campione di 1821 soggetti >18 anni
Sono stati:

- ✓ Misurati i **livelli di attitudini positive** verso la vaccinazione
- ✓ Misurati i **livelli di esperienza vaccinale** (genitori con figli 12-18 anni vaccinati per HPV; soggetti vaccinati per influenza ogni anno, negli ultimi 5 anni)
- ✓ Individuati i **determinanti delle attitudini positive** verso le vaccinazioni

2. Sviluppo di un simulatore dinamico di diffusione spazio-temporale in ambiente GIS per analizzare la diffusione di COVID-19

La piattaforma è in fase di sperimentazione per l'analisi dei dati di accesso alla COVID-19 nel triennio 202-2023 presso alcuni Pronto Soccorso dell'area metropolitana di Roma
Il sistema consente di:

- ✓ **geolocalizzare i casi** afferenti ai Pronto Soccorso, con analisi spazio-temporale di eventuali clusters
- ✓ **identificare le aree ad alta densità di accessi** ai Pronto Soccorso
- ✓ **identificare le caratteristiche spaziali e sociali** che possono aver favorito l'accesso ai Pronto Soccorso (densità della popolazione, distribuzione spaziale dei servizi, ecc.)

3. Analisi della performance accademica: confronto tra il period pre- e post-pandemico di COVID-19

Studio **cross-sectional** per valutare la prevalenza dei sintomi legati all'ansia da COVID-19 tra gli studenti universitari e le variabili associate ai cambiamenti della performance accademica dopo il periodo di emergenza.

- **Web-survey** diffusa da un panel provider accreditato.
- Individuato un panel con un bacino di utenza di 5000 studenti universitari italiani
- Dimensione del campione prevista: **2100 studenti universitari italiani**
- Iniziata la somministrazione del questionario

I risultati saranno confrontati con quelli di uno studio analogo svolto durante l'ultima ondata pandemica

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Prof. Roberto Di Santo

PE13 - One Health Basic and Translational Research Actions addressing Unmet Needs on Emerging Infectious Diseases

Spoke 5 – *New Therapeutic Strategies*

Department Contribution

Departments involved

- Dipartimento di Chimica e Tecnologie del Farmaco - Leader
- Dipartimento di Sanità Pubblica e Malattie Infettive

Personnel

- Prof. **Roberto Di Santo** (CTF) – PI
- Prof Roberta Costi (CTF) – Co-PI
- *Dott. Valentina Noemi Madia (CTF) RTDA (recruited with PNRR funds)*
- Prof. **Maria Elena Marcocci** (SPMI)
- PhD INFACT
- PhD co-funded fellowship (ex DM 118/23)

Background

- *Research Projects*: at international level, funded by EU (CHAARM FP7) or by international Institutes (Institute Pasteur Paris); at national level, funded by MUR-PRIN, Italian Cystic Fibrosis Foundation and by pharmaceutical companies (ALFASIGMA, -SIGMA-TAU)
- *Collaborations and international network*: Institut Pasteur Paris (France), NIH, Bethesda and Frederick (USA), Center for Disease Control and Prevention (CDC, USA), University of California San Diego (USA), KUL (Belgium), Uni. Nova de Lisboa (Portugal), Swiss Tropical Institute, Basel (Switzerland), ISS, CNR (Italy).

Aim

Fight emerging and re-emerging infectious diseases with (epi)pandemic potential

Needs:

- **improve the pharmacological arsenal** *vs* most viral families and MDR bacteria;
- production of **new drugs** active **against emerging infectious diseases;**
- develop **ready-to-use broad spectrum antiviral agents as a first line intervention**.

Challenge:

to develop novel antiviral/antibacterial **drugs** effective *vs* a broad spectrum of pathogens and **with high genetic barrier** towards resistance.

Change of paradigm:

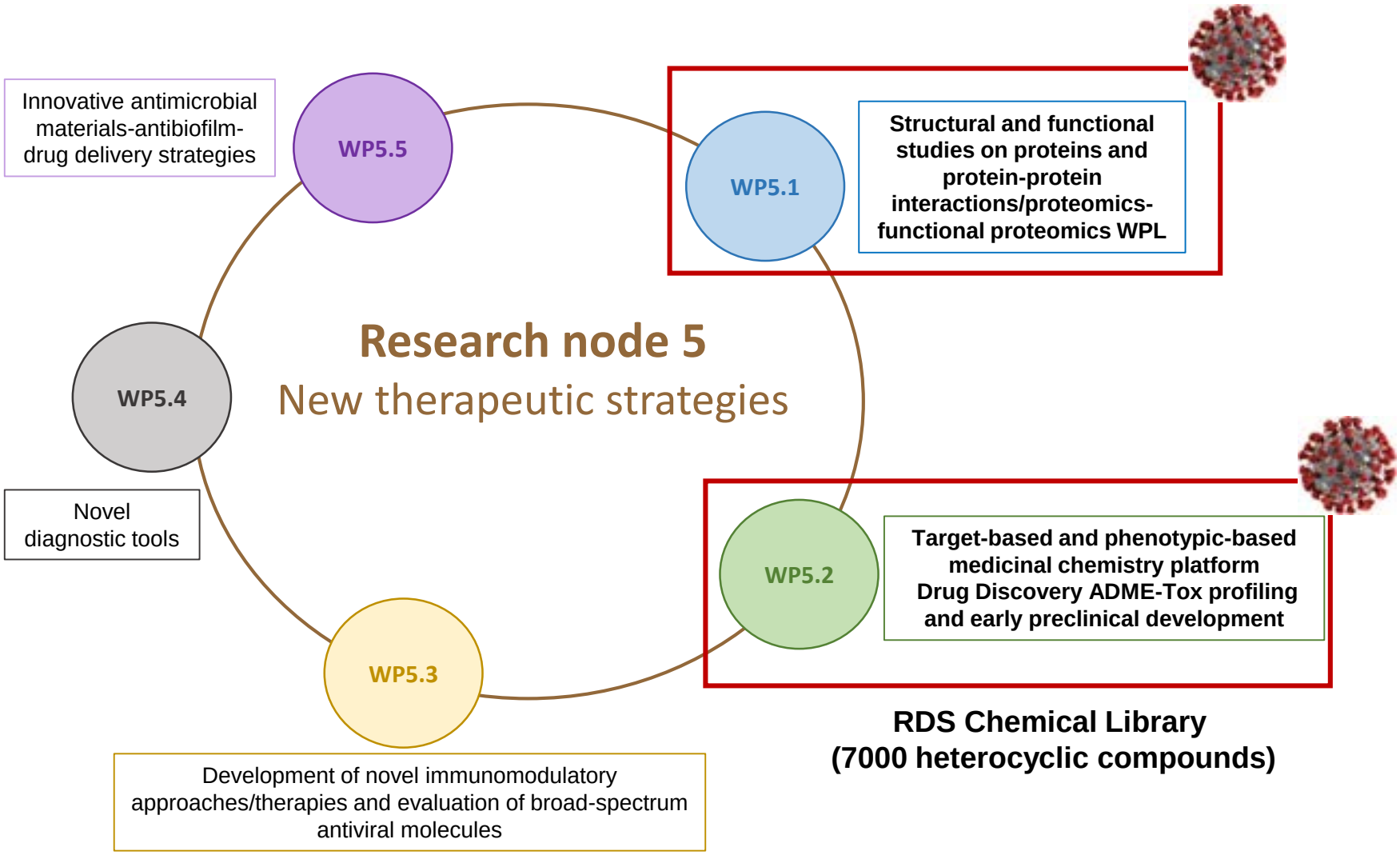
i) **target identification**, focused on the host-pathogen interface interactions;

ii) **medicinal chemistry**, *in silico* technologies, sustainable green chemistry, PK - *in vitro* ADME-tox evaluation (benign-by-design approach).

Multidisciplinary, integrated task force:

strong skills in **virology** and **drug discovery, design and development.**

RN5 (Spoke: CNR) - New therapeutic strategies



Green Chemistry - Sustainability

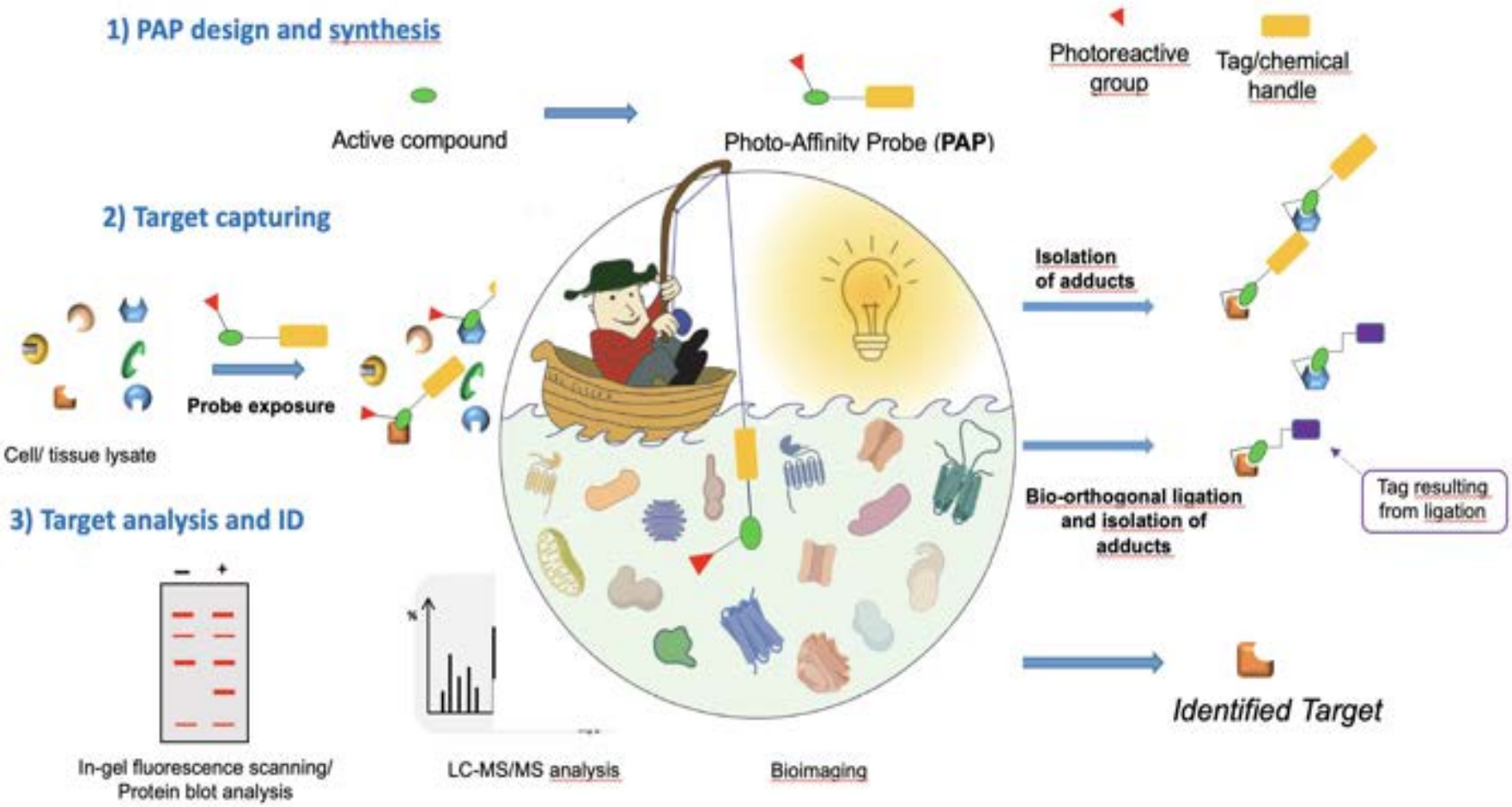
MW heating

Parallel Synthesis

SusChemistry

Flow Chemistry

Approaches: Chemical Biology
Target Identification – Photo Affinity Labeling (PAL)



Expected Results

Structural and functional studies on proteins and protein-protein interactions:

- **Identification of** PPI at the host-pathogen interface as potential **new drug targets**.

Target-based and phenotypic-based medicinal chemistry platform

(Drug Discovery ADME-Tox profiling and early preclinical development):

- By target-based and phenotypic-based drug discovery**: identification of (1-3) new drug candidates against** respiratory/vector-borne **emerging viruses** and **antimicrobial resistant pathogens (MDR)**;
- Identification of antiviral and antimicrobial agents **with low susceptibility to resistance evolution**;
- Drug discovery and new strategies **to mitigate pathogenicity against emerging infections**;
- **Good In vitro DMPK**, drug metabolism and pharmacokinetics–*in vitro*/*in vivo* ADME-Tox characterization.

Expected Impact: Short- and Long-Term

1. *Career-Development and Training Opportunities for Young Researchers;*
2. *Involvement of Private Partners and Technology Transfer*: **preclinical candidates** could be of interest **for Pharma Companies** for their development: product licensing, technology transfer, IP rights
3. *Impact on the Economic, Social and Cultural System*:
   - **New synergies with private companies** to establish reliable and efficient drug-discovery and optimization pipelines
   - **Strengthening competitiveness of Italian scientific** community in the area of emerging and re-emerging infectious diseases.
   - **Treatments to counter-act antibiotic resistance** and driving basic science to clinical application via innovative strategies of therapy
   - Reducing mortality and improving the quality of life through the **reduction of medical and social impact of new epidemics/pandemics**

Useful Contacts

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INF-ACT Website: https://www.inf-act.it/

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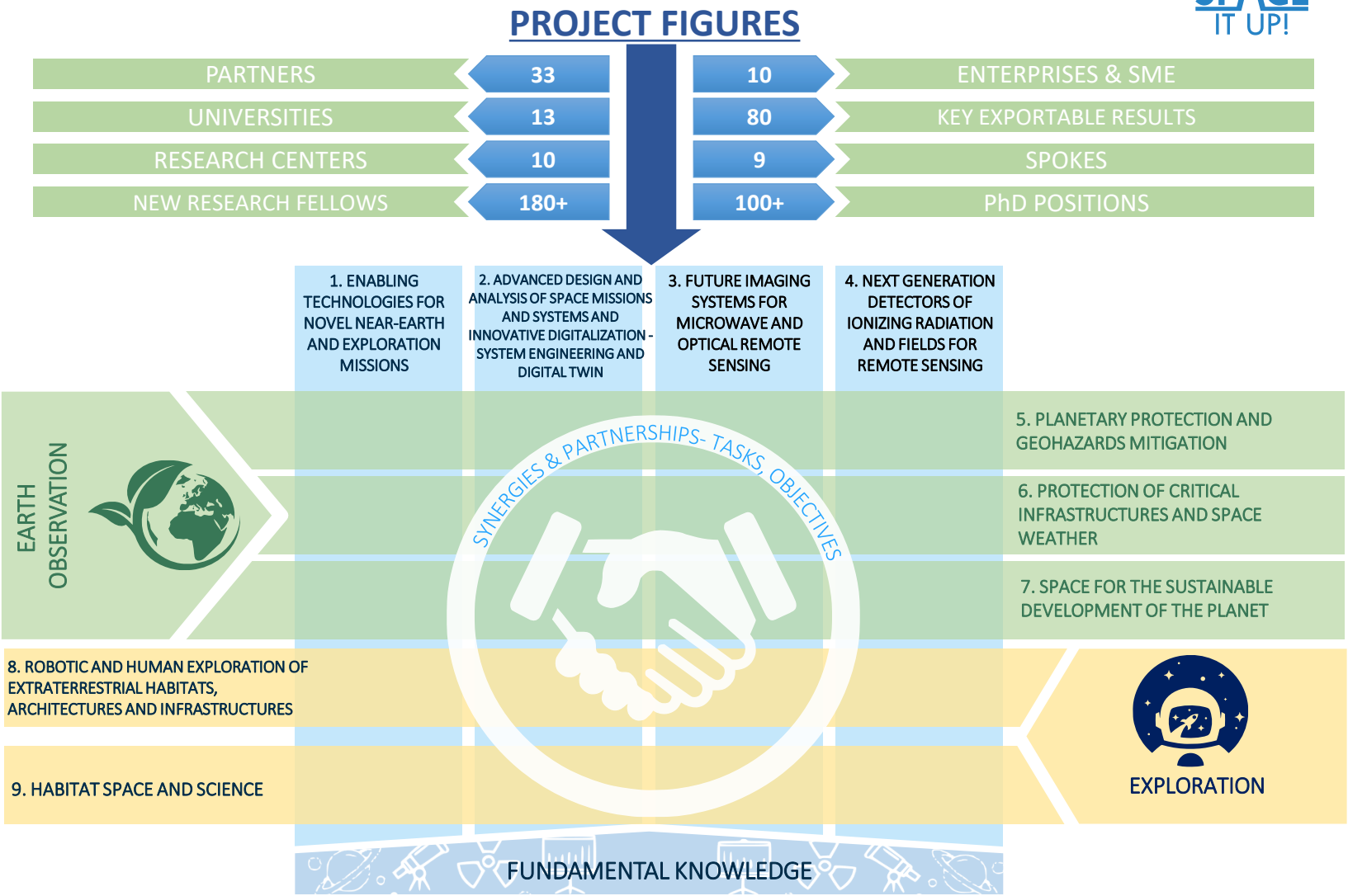
Partenariato Esteso Spazio PE15

Space It Up!

Foto: Stefania Sepulcri (Stampa e comunicazione)

Partenariato Esteso Spazio: PE15

Overview struttura: HUB + Spokes



Project Objectives

PROMOTE INNOVATION AND EXTEND FUNDAMENTAL KNOWLEDGE

FOSTERING A SUSTAINABLE FUTURE

ENSURE LONG-TERM HUMAN PERMANENT IN EXTRATERRESTRIAL SPACE

STRENGTHENING THE SPACE 'ECOSYSTEM' IN ITALY

Project Funding and staff

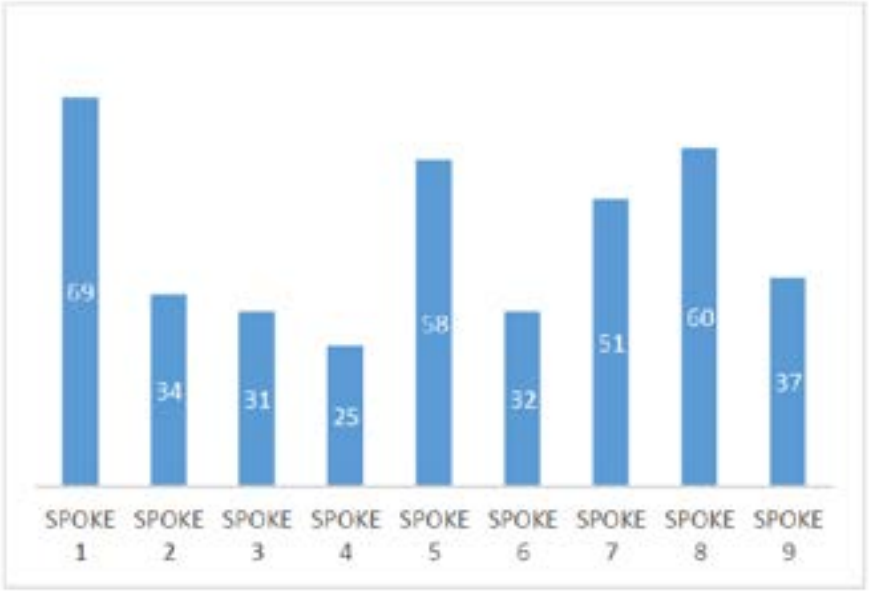


Figure 10. Number of resources per spoke

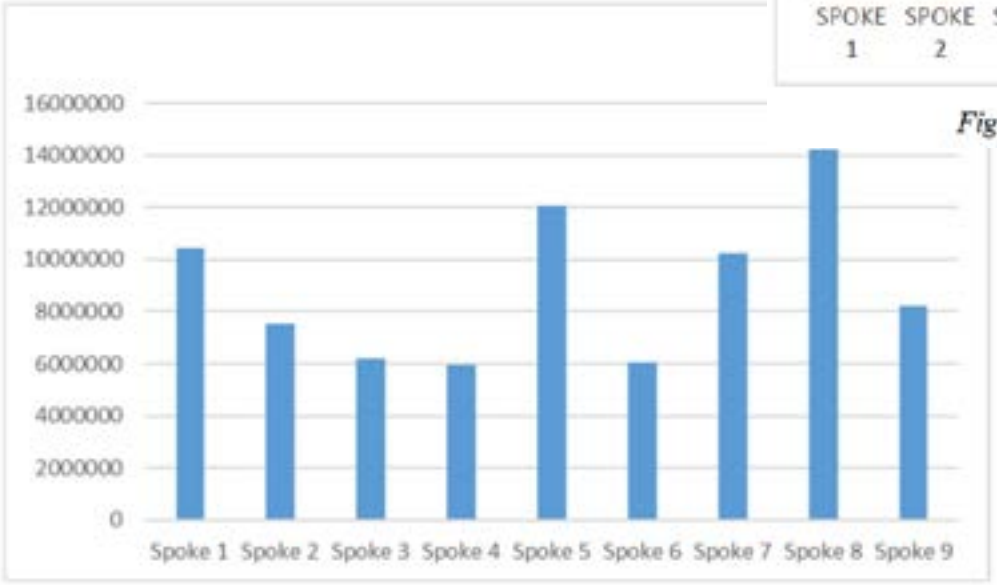


Figure 3. Total budget per spoke (€)

Overall funding

€ 79.567.777,14
(ASI+PCM – MUR)

Partners

33 Partners: 13 Universities, 10 Research Centers, 10 Enterprises

Partners

Other Partners

Spoke 1

Spoke 1
Enabling Technologies for Novel Near-Earth and Exploration Missions

Mission Statement

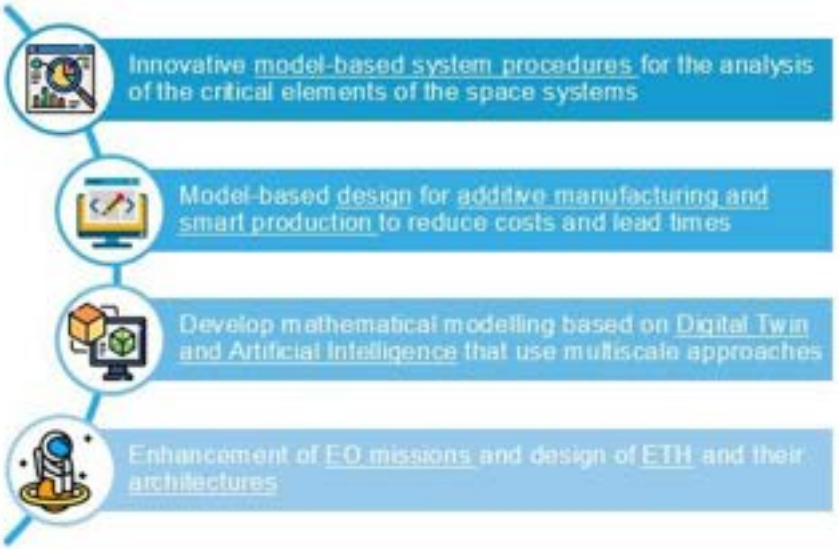
Spoke 1 covers **research and development** activities at low TRL with the aim to promote a technological push that enables **novel missions** for the **protection** and the **sustainable development of the planet**, as well as for **planetary exploration** missions. Emphasis is on the development of enabling technologies to lower the satellite altitudes and to carry out space missions using distributed systems. These two concepts have the potential to produce enhanced Earth observation products and services.

Goals

Spoke 2

Spoke 2
Advanced Design and Analysis of Space Missions and Systems and Innovative Digitalization - System Engineering and Digital Twin

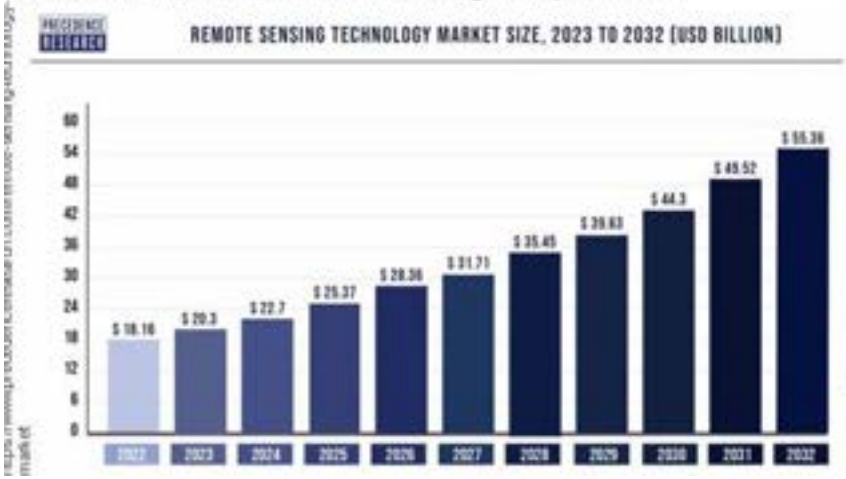
Mission statement Modelling and stress-testing space mission and systems as well as MAIT processes can drive a much higher level of resilience. **Digital twins represent a fundamental asset** to pursue this goal as they allow to make consequence-free errors while testing the system and widen design spaces. The opportunities are enormous and are changing how we design, manufacture, assembly, integrate and test components and subsystems. In this domain, Spoke 2 wants to explore and improve the TRL on design and analysis of space missions and systems via system engineering and digital twin.



Spoke 3

Spoke 3
Future imaging systems for microwave and optical remote sensing

Mission statement Fostering research and development activities to study new, **high-performance sensors** for Earth observation from space operating in the visible and infrared wavelengths, and in the microwaves. Thanks to improvements in **miniaturization and formation flying**, special emphasis will be on distributed functions among nanoplatforms.

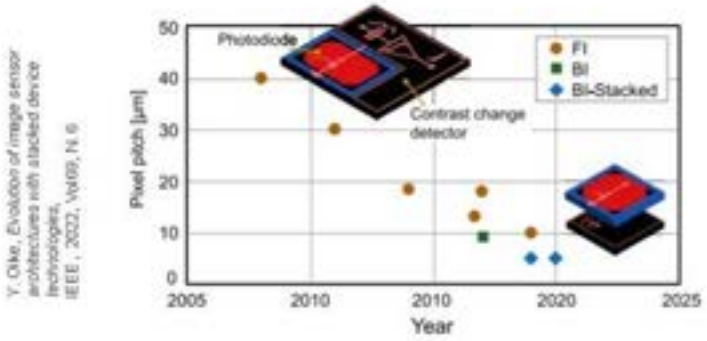


- Distributed SAR (DSAR) based on nanosatellites/cubesats operating in formation
- Design of a spectrometer on-chip for sub-mm remote sensing
- Digital radar technologies for advanced Earth Observation missions
- Key enabling technologies for optical imaging payloads on nano/cubesats

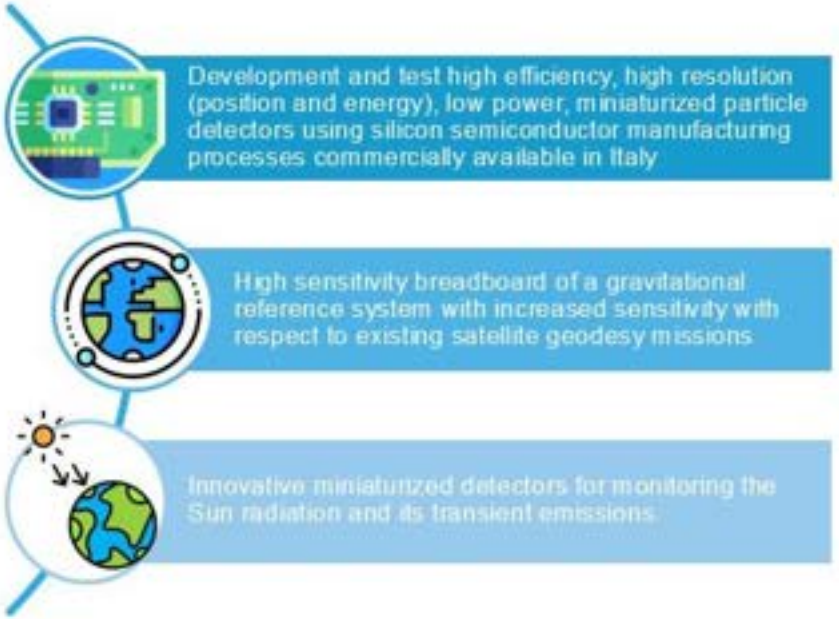
Spoke 4

Spoke 4
Next Generation Detectors of Ionizing Radiation and Fields for Remote Sensing

Mission statement Design, **develop and qualify high resolution, miniaturized detection systems for the next decades satellite missions** observing ionizing radiation around the Earth and water reservoirs on the Planet. **Establish a reliable supply chain of national manufacturers** for all critical components of the detector systems, integrated sensors, electronics and mechanical units, on the basis of successful heritage projects.



Y. Oike, *Evolution of image sensor architectures with stacked device technologies*, IEEE , 2022, Vol69, N. 6



Spoke 5

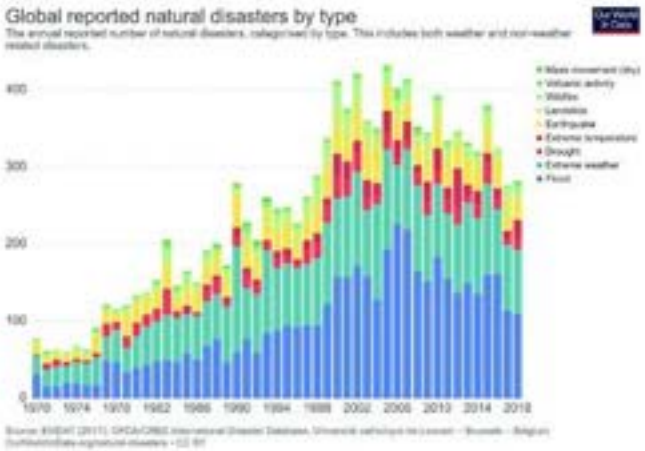
UNIVERSITÀ DI TRENTO

ISTITUTO NAZIONALE DI GEOFISICA E VULCANOLOGIA

SPACE IT UP!

Spoke 5
Planetary Protection and Geohazards Mitigation

Mission statement The prosperity and development of contemporary, strongly interconnected societies depend significantly on the ability of mitigating the effects of natural and anthropogenic disasters. Objective of **Spoke 5** is to explore and improve the TRL on **innovative methods of space observation for the protection from natural disasters** using **nanosatellite constellation architectures** aimed to the **mitigation of the effects of natural and anthropogenic disasters on the Earth's surface**.



- Explore monitoring of rapid hazard phenomena and identify current gaps to be filled.
- Mission concepts and tools for mitigating natural hazards induced damages
- Design of infrastructures for implementation and operations of sustainable mitigation strategies
- Development of innovative technologies for improved mitigation strategies

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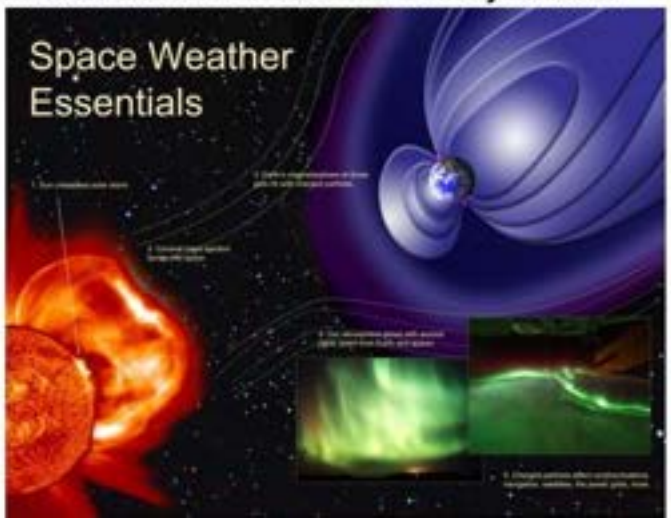
Ministero dell'Università e della Ricerca
Finanziato dall'Unione europea NextGenerationEU

Spoke 6

Spoke 6
Protection of Critical Structures and Space Weather

Mission statement Expanding our knowledge of the Sun-Earth interaction to address **Space Weather** (SWE) phenomena, thereby improving our understanding of the underlying physical processes, the **effects of on ground and space-based infrastructures**, and the ability to **monitor and forecast them in a timely manner**.



- •Expanding and improving theoretical models of the heliospheric environment and its dynamics;
- Studying innovative space architectures and developing payload breadboards for SWE
- Developing software tools for SWE forecasting
- Evaluate the SWE effects on ground and space-based infrastructures

Spoke 7

Consiglio Nazionale delle Ricerche

GRAN SASSO SCIENCE INSTITUTE
SCHOOL OF ADVANCED STUDIES
Scuola Universitaria Superiore

SPACE IT UP!

Spoke 7
Space for the sustainable development of the planet

Mission statement Earth observations (EO) promise to support the achievement of several **Sustainable Development Goals**. Spoke 7 aims at developing EO with breakthrough potential for operational services of the future. **Innovation** in both **instrument** and **algorithm** technologies, as well as in the **economical and legal** aspects, is expected. Spoke 7 aims to improve current capabilities in process observation and prediction, based on a true market demand to maximize return on investments.

- Develop EO solutions with breakthrough potential for operational services of the future
- Enhance end-to-end performances - from the observed scene to the retrieved parameters - with increasing usage of AI and HPC
- Improve capabilities in process observation, understanding and prediction through numerical models, data assimilation, digital twin, and demand-based mission design
- Enhance new space economy & evaluate the legal impacts of EO for green and climate-resilient policies

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Spoke 8

Spoke 8
Robotic and Human Exploration of Extraterrestrial Habitats, Architectures and Infrastructures

Mission statement Fostering research and development activities to **support future human missions** with a strong interdisciplinary connotation. Main activities will involve **enhancement of current capabilities on space robotics, sensors, instrumentations, extra-terrestrial habitats, infrastructures and architectures.**

McCarthy, N. (April 12, 2021). The Evolution Of Human Space Flight [Digital image] Retrieved November 21, 2023, from https://www.statista.com/chart/24604/number-of-people-launched-into-space-by-year/

- Technology developments for robotic exploration of potential extraterrestrial habitats
- Mission concepts and tools for sustainable human exploration of the solar system
- Design of infrastructures for implementation and operations of sustainable exploration architecture
- Development of enabling systems and technologies for extraterrestrial habitats

Spoke 9

Spoke 9
Habitat, Space and Science

Mission statement Spoke 9 is about the investigation of planetary resources and involves in situ and laboratory research to study lunar, Martian, and asteroidal materials together with the development of space mining technologies and resource mapping. Space is one of the harshest environments imaginable for both spacecraft and humans. In this regard, Spoke 9 also carries out studies to increase the knowledge on physiological and biological bases of space adaptations as well as on countermeasures to radiation and altered gravity

Performing analyses to study plasma, dust, exosphere/atmosphere interactions, and to check the habitability of extraterrestrial planets or moons. Characterizing the sites in terms of geology, geomorphology, mineralogy, chemistry, and geophysics. Developing methods and techniques for life signature.

Performing mineralogical, petrologic, geochemical and geotechnical studies of lunar, Martian and asteroid meteorites. Developing space mining technologies. Studying terrestrial analogs.

Increasing the knowledge of key physiological functions and organs for long-term space exploration. Identifying early biomarkers of physiological impairment, the time course of alterations, and alterations in organ crosstalk.

Developing high-tech controlled systems to guarantee safe and high-quality food by a seed-to-seed cycle. In situ recycling of the organic waste substance. Studying the regolith as an in-situ resource (ISRU) to be used for human settlements through additive manufacturing.

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Iniziative PNRR nella Facoltà di Farmacia e Medicina.

SPOKE 8 – Robotic and Human Exploration of Extraterrestrial Habitats, Architectures and Infrastructures
"Attività spaziali" (tematica 15), di cui all'avviso MUR n. 341 del 15/03/2022, per "Partenariati estesi alle università, ai centri di ricerca, alle aziende per il finanziamento di progetti di ricerca di base"

Foto: Stefania Sepulcri (Stampa e comunicazione)

Task 8.4.2 Human factors - Objective

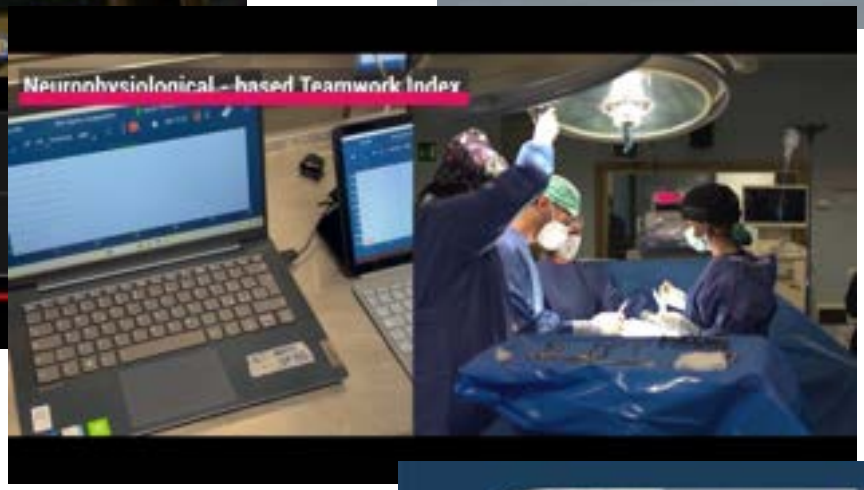
To address factors related to the psychological, muscular, and cardiovascular conditions as well as the workload endurance of pilots and space crew through subjective and biometric

Description: Focus on crew response to spaceship/space habitats, monitoring crew conditions by means of subjective and biometric measurements.

What we will likely do: reviewing and identifying the most important human factors (HFs) involved in space activities, technologies and methodologies to monitor and optimize operators' cognitive and emotional states, and performance at individual and team level through neurophysiological data analysis.

We may also plan to run experiments able to replicate space – like contexts if other partner(s) are interested in this activity.

Duration: M10 (May 2025) – M30 (Jan 2027)
Deliverable: D8.4.2 - Report on human factors (R: UNIROMA1) at M12, M24 and M30



Iniziative PNRR nella Facoltà di Farmacia e Medicina.
Rome Technopole, Centri Nazionali e Partenariati estesi

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Iniziative PNRR nella Facoltà di Farmacia e Medicina.

Infrastrutture di Ricerca:
European Brain ReseArch InfraStructures-Italy [EBRAINS-Italy]

EBRAINS Italy

Foto: Stefania Sepulcri (Stampa e comunicazione)

European Brain ReseArch InfraStructures-Italy [EBRAINS-Italy]

Rete di 27 Gruppi di Ricerca sparsi in 10 regioni.

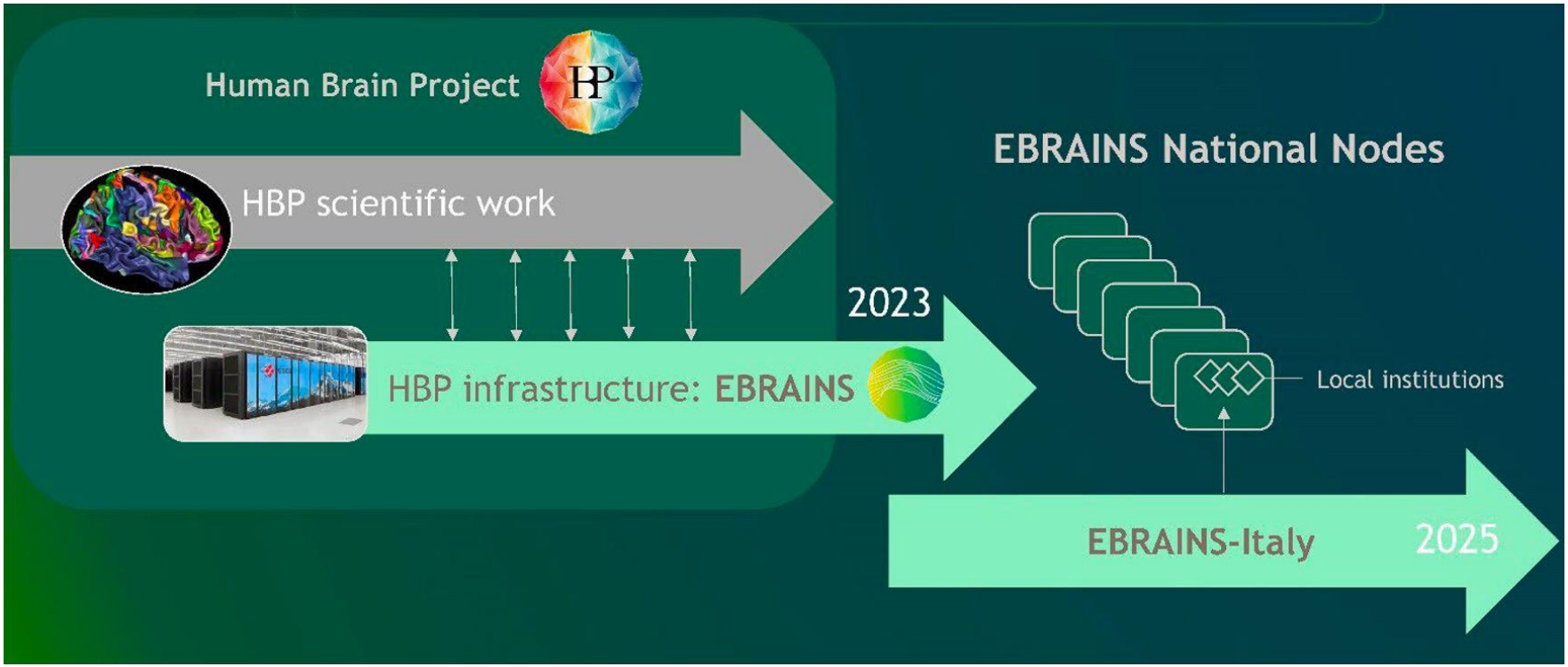
Coordinamento: Consiglio Nazionale Ricerche

Budget totale: 22 Mio €

Bando PNRR: **Rafforzamento e creazione di Infrastrutture di Ricerca**

Missione 4 ‘Istruzione e Ricerca’ - Componente 2 ‘Dalla Ricerca all’Impresa’
Linea di Investimento 3.1 del PNRR
Linea ESFRI H&F (Health and Food)

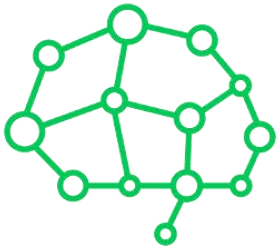
The Italian node of EBRAINS



EBRAINS.eu is a digital infrastructure that provides access to a free and open database of **neuroscience services** for researchers, clinicians, scientists and students.

Aims

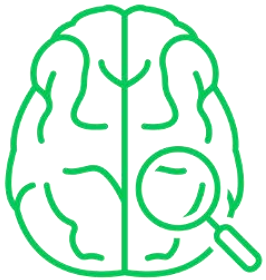
EBRAINS aims to translate scientific findings from **Neuroscience** into medical and industrial innovations for the benefit of patients and society in general.



Data and Knowledge
Online solutions to facilitate sharing of and access to research data, computational models and software

Simulation
Solutions for brain researchers to conduct sustainable simulation studies and share their results

Brain-Inspired Technologies
Understand and leverage the computational capabilities of spiking neural networks



Atlases
Navigate, characterise and analyse information on the basis of anatomical location

Strategic roadmap

EBRAINS has been included in the 2021 Roadmap of the European Strategy Forum on Research Infrastructures (**ESFRI**).

Sapienza within EBRAINS-Italy

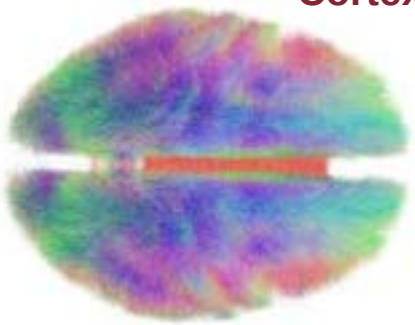
RESEARCH UNITS:

UNIT a (PI: Stefano Ferraina)

Other Personnel: Giampiero Bardella (RTD-A)

Budget: 650 M €

Cortex

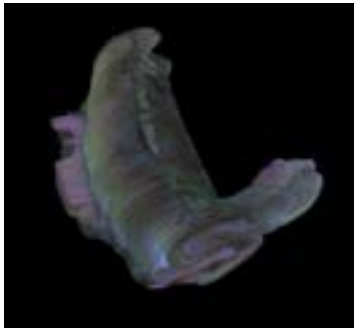


Hippocampus

UNIT b (PI: Massimiliano Renzi)

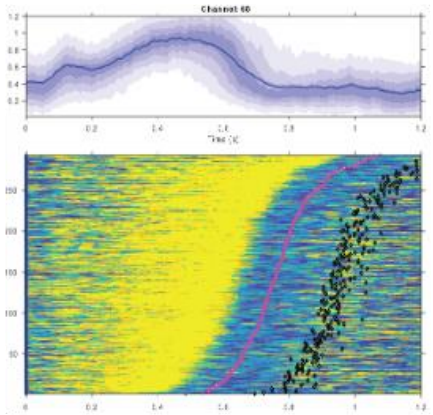
Other Personnel: Gilda Chilà (PhD student)

Budget: 130 M €



UNIT a. Data and Data analysis tools. Formative events.

The Ebrains Open Lab for neurOphysiology (EOLO)



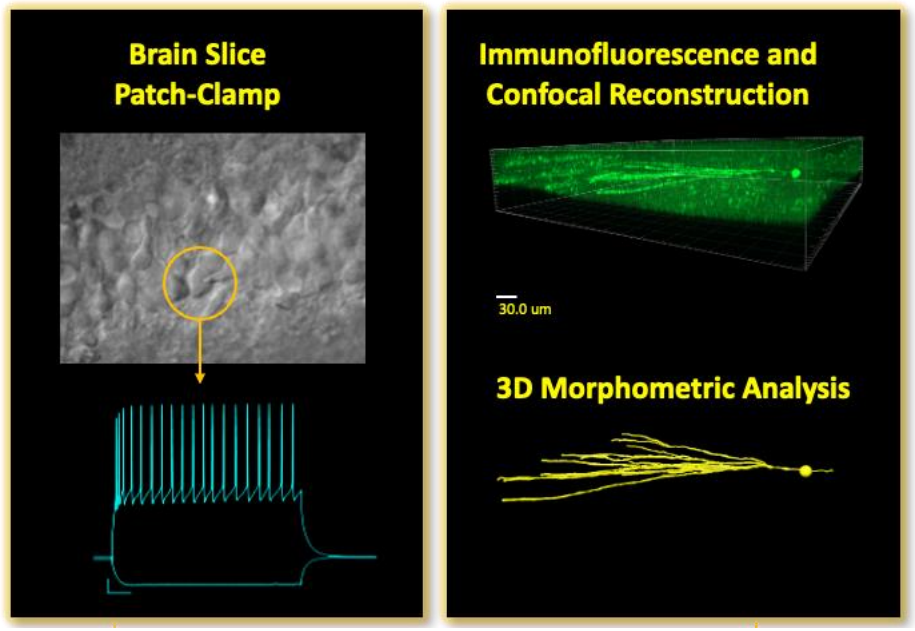
High-density Neurophysiological data from behaving animals

Curation and Analysis Tools

Data and Knowledge

Interdisciplinary training in Neurotechnology

UNIT b. Functional and structural analysis of mouse hippocampal neurons along aging.



Ongoing collaborations with EBRAINS-Italy:

Institute of Biophysics CNR Palermo

Università Federico II

Università di Modena e Reggio Emilia

European Brain Research Institute

Data and Knowledge

Atlas

Ongoing Results: > 120 full datasets describing properties of hippocampal pyramidal neurons, granule cells and different subtypes of interneurons (age points: 3-, 12- and 24- months)

Planned Impacts

SAPIENZA RESEARCH INFRASTRUCTURES
acting as a local hub for facilitating EBRAINS access

Sapienza Neuroscience Community → EBRAINS Sapienza Italy → EBRAINS

NATIONAL AND LOCAL NEUROSCIENCE COMMUNITY AND STAKEHOLDERS:
fostering neurotechnology advancements

EBRAINS Sapienza Italy → MNESYS PE 12

EBRAINS Sapienza Italy → ROME TECHNOPOLE INNOVATION ECOSYSTEM Spoke 6

Joint Lab: NeuroAI-Boost [Artificial Intelligence]

Open Lab: Brain-Tech Lab [Neurotechnologies]

stefano.ferraina@uniroma1.it [@Dip Fisiologia e Farmacologia]

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