Master of Science in BIOMEDICAL SCIENCES
UNIVERSITÀ DEGLI STUDI DELL'INSUBRIA
Academic Year 2025/26

THESIS PROJECTS (II)

UNIVERSITÀ DEGLI STUDI DELL'INSUBRIA – DIMIT

Laboratorio di Fisiologia Umana

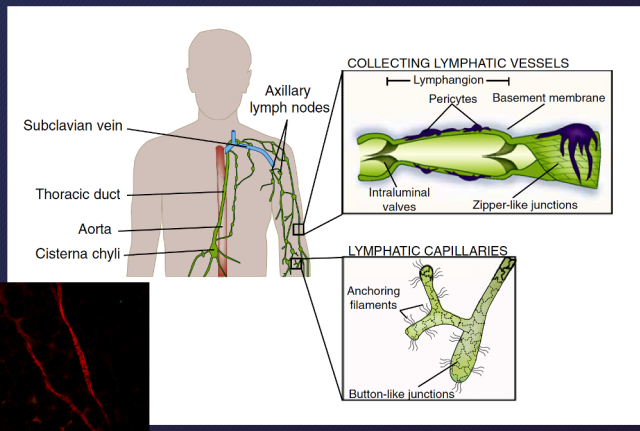
NEW

Andrea Moriondo, Daniela Negrini,
Cristiana Marcozzi, Eleonora Solari, Chiara Ottaviani

Master Thesis Project

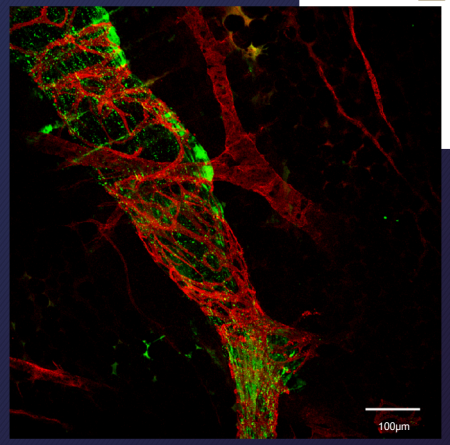
The ***lymphatic system*** drains lymph from the interstitium and serosal cavities, returning it to the venous system.

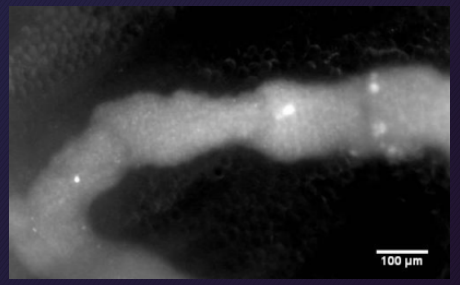
Ongoing projects: analysis and modulation of lymph flow due to ***intrinsic*** and ***extrinsic*** forces



Main techniques:

- *ex vivo* functional experiments on rodent tissue samples
- stereomicroscopy
- fluorescence microscopy
- image analysis





Contact: andrea.moriondo@uninsubria.it

UO Farmacovigilanza e Ricerca Clinica

Centro di Ricerca Clinica

- Progettazione e sviluppo degli studi clinici promossi dalla ASST FBF-Sacco
- Gestione degli studi clinici promossi dalla ASST FBF-Sacco, altri enti/aziende farmaceutiche (study coordinator e processamento campioni biologici)
- Revisione/predisposizione della documentazione da presentare al Comitato Etico
- Analisi dei dati ed elaborazione dei risultati

Farmacovigilanza

- Coordinamento e gestione di progetti di farmacovigilanza attiva (Progetti AIFA)
- Raccolta e gestione delle schede di sospette reazioni avverse ai farmaci e loro inserimento nella Rete Nazionale di Farmacovigilanza
- Raccolta e gestione delle schede di sospette reazioni avverse a fitoterapici
- Analisi del segnale condotta su dati estratti da database di segnalazione spontanea internazionali
- Gestione politerapie pazienti ASST

Ricerca

- Revisioni sistematiche e meta-analisi
- Network meta-analisi
- Analisi database amministrativi

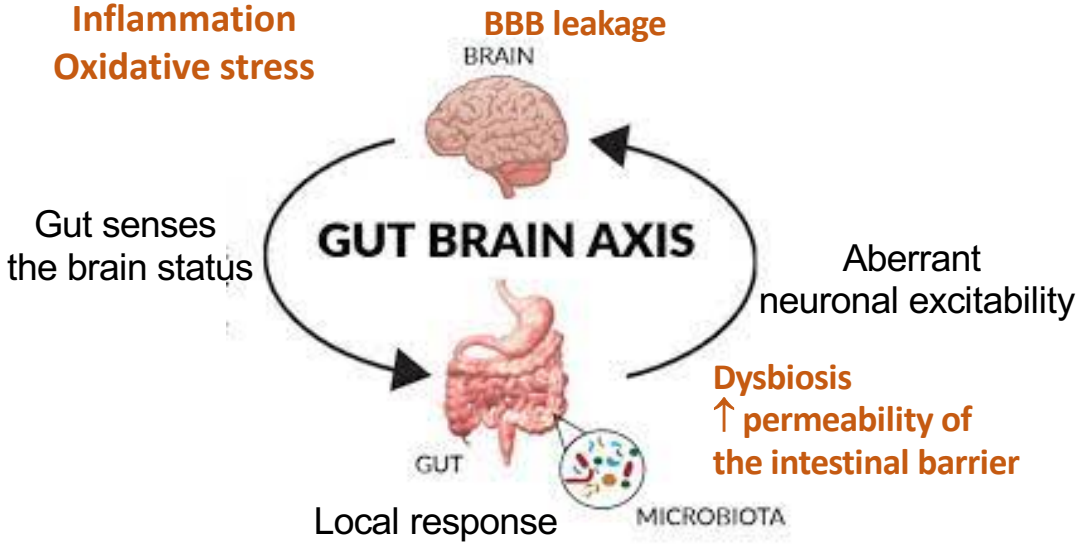
The role of the gut-microbiota-brain axis in epilepsy

Istituto di Ricerche Farmacologiche Mario Negri-Milano; Laboratory of Experimental Neurology

Annamaria Vezzani, Teresa Ravizza, Silvia Balosso

Gut-microbiota-brain axis dysfunction is emerging as a new pathogenic mechanism in epilepsy. Inflammation and oxidative stress may favour gut-brain cross-talk.

This project aims at studying gut dysfunction(s) and intestinal inflammation/oxidative stress in experimental models of acquired epilepsy. Interventions on gut with pharmacological or special diets/pro-/pre-biotics will test the effect of dysbiosis on epilepsy development in mouse or rat models.



Techniques

- ✓ Preparation of paraffin-embedded tissue
- ✓ Histology and immunocytochemistry
- ✓ Image acquisition/quantification
- ✓ RTqPCR
- ✓ In vitro models (cell cultures)
- ✓ Biochemical assays (Western blot, Elisa)
- ✓ Electroencephalography

Contact:
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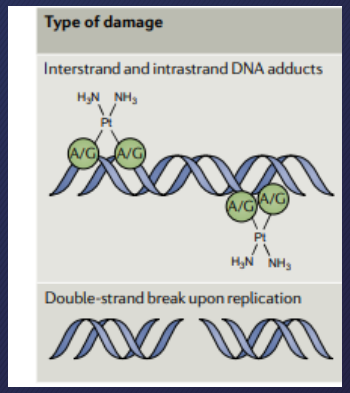
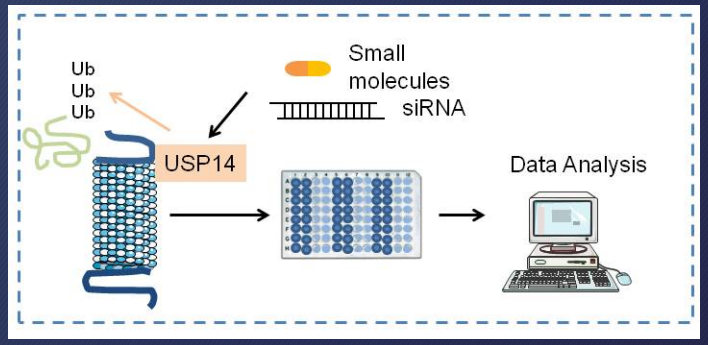
Department of Experimental Oncology, Fondazione IRCCS Istituto Tumori Milano, via Amadeo 42, Milan
MOLECULAR PHARMACOLOGY UNIT
Team Leader: Paola PEREGO, PhD - paola.perego@istitutotumori.mi.it

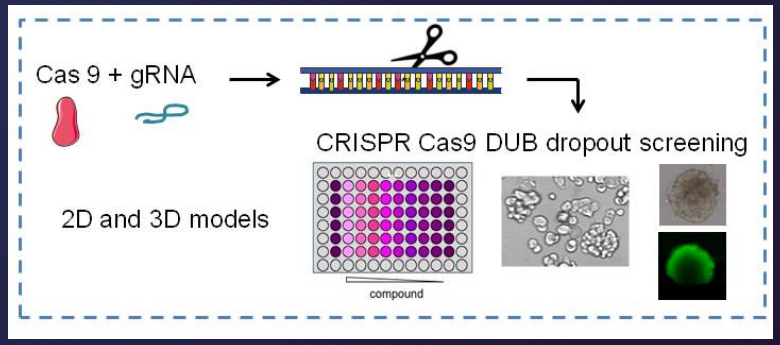
ONGOING PROJECTS

Modulation of ovarian carcinoma resistance to cisplatin by targeting deubiquitinases. Platinum-based therapy remains the standard in ovarian cancer, although drug resistance develops. Deubiquitinases (DUBs) remove ubiquitin (Ub) from target proteins. Inhibition of USP14, a proteasome-associated DUB results in accumulation of poly-Ub proteins and cell toxicity. Working hypothesis: USP14 targeting may allow modulation of cisplatin resistance. The aim of the project is to determine USP14 role in mediating the survival of ovarian carcinoma by using molecular tools.



Rottenberg, Disler and Perego et al , Nat Rev Cancer, 2021





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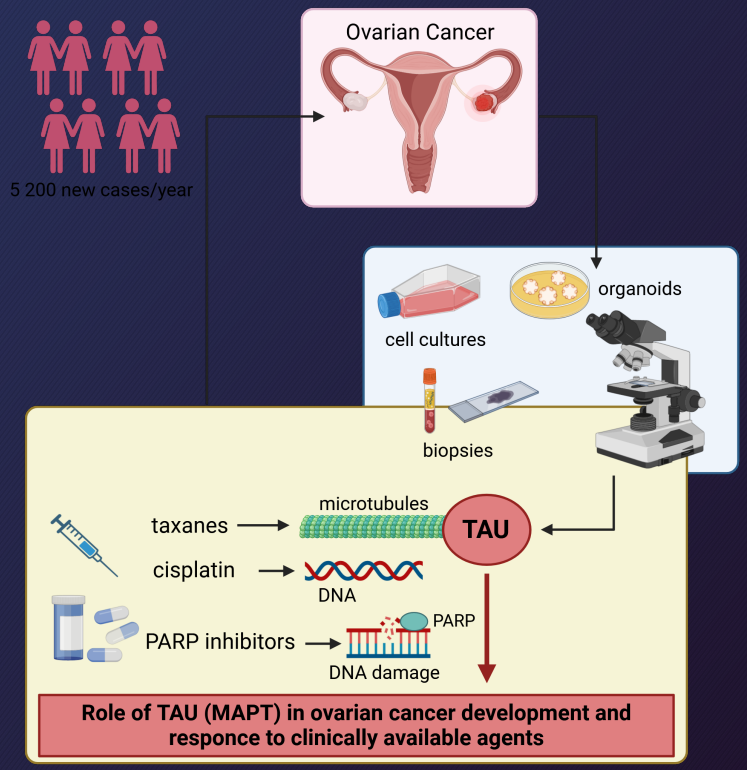
ONGOING PROJECTS

Dissecting the role of tau in ovarian cancer pathogenesis and in drug-resistance. The microtubule interacting protein tau (coded by MAPT) plays a role in the pathogenesis of tauopathies, neurodegenerative diseases associated to tau mutation. Working hypotheses: MAPT mutations increase cancer risk, implying that tau may contribute to the etiopathogensis of cancer, including ovarian cancer. Since tau is physically associated to microtubules it can impact on response to microtubule stabilizers such as taxanes, used in first line ovarian carcinoma therapy. The known role of tau in genomic instability may result in resistance to DNA damaging agents clinically available for ovarian carcinoma. The aim of the project is to determine tau role both in etiopathogenesis and drug resistance of ovarian carcinoma by molecular and biochemical approaches suing 2D and 3D preclinical models and tumor specimens.

Ministero della Salute
Direzione generale della ricerca e dell'innovazione in sanità
PNRR: M6/C2_CALL 2022 Full Proposal

Finanziato dall'Unione europea
NextGenerationEU

Project Code: PNRR-MAD-2022-12376508	**Call section:** Malattie Croniche non Trasmissibili (MCnT) ad alto impatto sui sistemi sanitari e
Applicant Institution: Fondazione Istituto Nazionale per lo studio e la cura dei tumori - Milano	**Applicant/PI Coordinator:** Perego Paola Maria Chiara



INSTITUTE OF ONCOLOGY RESEARCH -IOR
Bellinzona, Switzerland

TumorBiology and Experimental Therapeutics Program

CONTACTS
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Dr. Giuseppina CARBONE pina.carbone@ior.usi.chi

ISTITUTO ITALIANO DI TECNOLOGIA
GENETICS OF COGNITION

Francesco Papaleo

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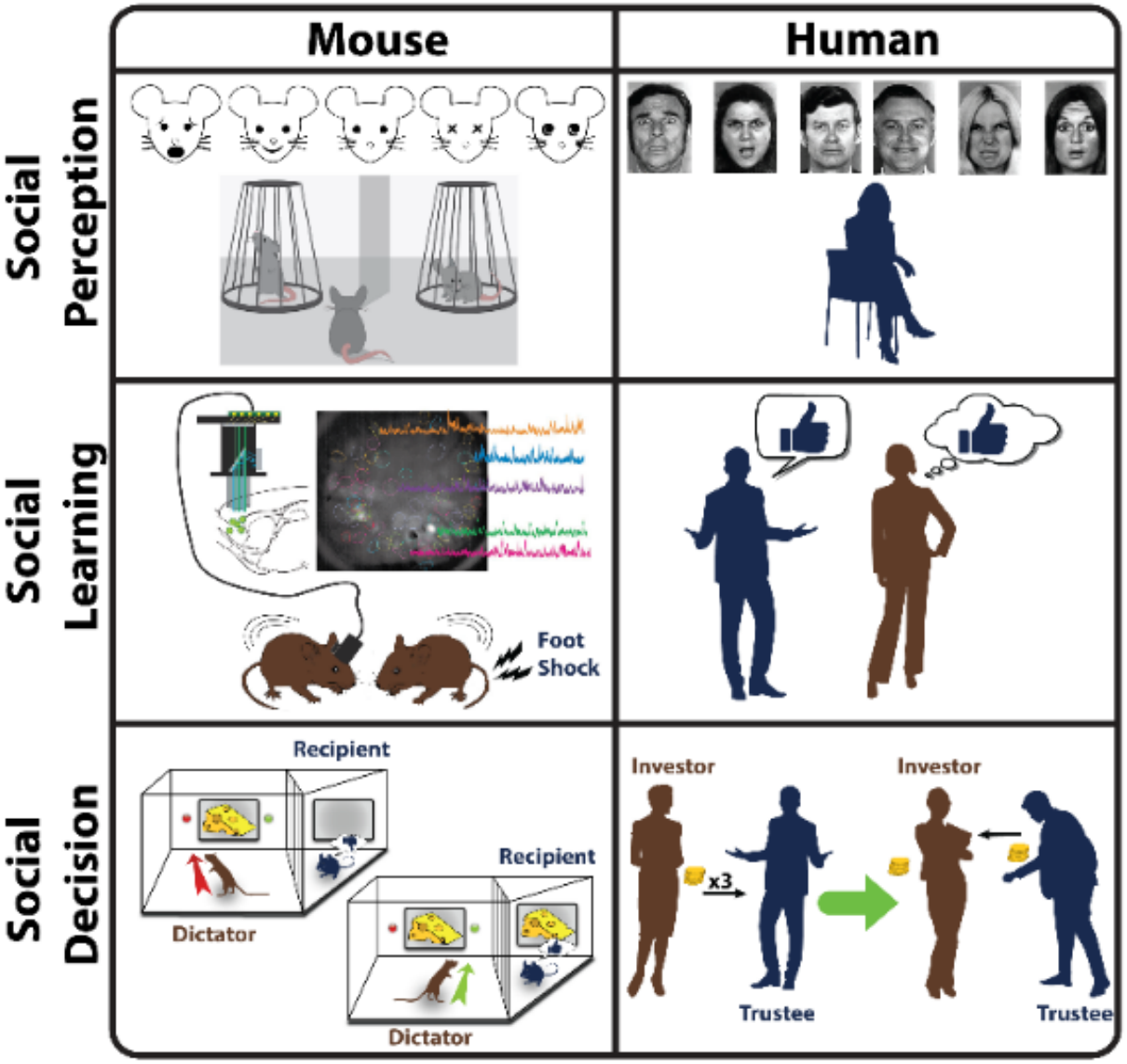

Emotion Recognition

Observational Learning, Emotional Contagion, Social Anxiety

Altruistic/Selfish Choices, Cooperation, Trust, Consolation

Ferretti et al., Curr. Biol. 2019; Scheggia et al., Nat. Neurosci. 2020; Maltese & Papaleo, Neuron 2020; Scheggia & Papaleo, Curr. Biol. 2020; Scheggia et al., Nat. Neurosci. 2022; Dautan et al. 2024 Nat. Neurosci.

I.R.C.C.S. Ospedale San Raffaele

1

PROJECT 1: Signalling dynamics in the interaction between tumor cells and macrophages in malignant mesothelioma

Malignant mesothelioma (MM) is a devastating tumor that thrives in an inflammatory microenvironment fueled by macrophages (MOs). Our laboratory has demonstrated that interfering with the axis formed by the alarmin HMGB1, the chemokine CXCL12 and the receptor CXCR4 modulates MM-MOs interaction leading to tumor remission (PMID: 33956406), through a mechanism that remains unclear. Since the transcription factor NF-kB is downstream of this axis (PMID: 32983169), and we and others have shown that its dynamics is determinant for its function (PMIDs: 26765569, 34140389), we hypothesize that NF-kB dynamics determines MM-MOs interaction.

To test our hypothesis, we will use our MM mouse models combined with our established approach of live cell imaging of NF-kB (PMID: 35844496) on MM cells and on MOs derived from a novel mouse model available in our laboratory where NF-kB is fluorescently tagged (PMID: 36417863), alone or in 2D and novel 3D MM-MOs co-cultures, and potentially through intravital imaging. In particular, we will evaluate through imaging and gene expression assays how MOs polarization is influenced by NF-kB signaling, and how this is modulated by HMGB1 and CXCL12 (present in the tumor microenvironment) and by treatments that are being currently tested in the lab.

Thesis Supervisor: Samuel Zambrano, Vita-Salute San Raffaele University,

Contact: zambrano.samuel@hsr.it

I.R.C.C.S. Ospedale San Raffaele

2

PROJECT 2: P53 dynamics in the emergence of resistance to therapy in colorectal cancer

Colorectal cancer (CRC) is one of the most common cancers; the resistance to therapy is a major concern with “persister” populations observed in CRC cells upon treatments with genotoxic compounds, from which resistant cells might emerge (PMC9279152). On the other hand, it is recognized that the cell-to-cell variability in p53 transcription factor signaling dynamics in response to genotoxic stress is a main driver of cancer cell response (PMID: 30585287). Importantly, inflammation is a common situation in CRC and NF-κB, the master regulator if innate immune responses, is often activated. Our current data shows that p53 and NF-κB activation influence each other’s activities in the colorectal cancer cell line HCT116 and that p53 is activated upon genotoxic treatments. The aim of the project is to verify if p53 dynamics, alone or in synergy with NF-κB activation, could be predictive of the response to therapies in CRC HCT116 cells.

To this aim, HCT116 colorectal cancer cell line, where p53 is WT, will be used as model. Immunofluorescence and Western Blot will be used to verify the nuclear accumulation dynamics of endogenous p53 and NF-kB under different stimuli. Live-cell imaging will be used in HCT116-p53GFP stable tagged cells to follow the single’s p53 dynamics in response to different stimuli, both in normal, persister and resistant cell populations.

Thesis Supervisor: Samuel Zambrano, Vita-Salute San Raffaele University,

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I.R.C.C.S. Ospedale San Raffaele

Thesis Supervisor: Dr. De Magis Alessio

Group Leader: Prof. Marco Bianchi

3

There has been growing evidence indicating that the innate immune cascade is activated following the stabilization of secondary DNA structures called G-quadruplexes (G4s). Our research proposal aims to investigate the role of the non-histone protein HMGB1 in mediating G4-induced Interferon signalling. We will dissect the specific pathways activated after treatment with G4 stabilizers. Given the pivotal role of the innate immune system, our research has the potential to open new avenues in using G4 stabilizers in conjunction with HMGB1 inhibitors as immunostimulatory drugs.

The research proposal will incorporate state-of-the-art methodologies including CRISPR-Cas9 and Proximity Ligation Assay. Additionally, it will utilize conventional molecular biology techniques like immunofluorescence, RNA isolation, cDNA retrotranscription, and quantitative PCR (qPCR).

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I.R.C.C.S. Ospedale San Raffaele

Thesis Supervisor: Rosanna Mezzapelle

Group Leader: Marco Emilio Bianchi

4

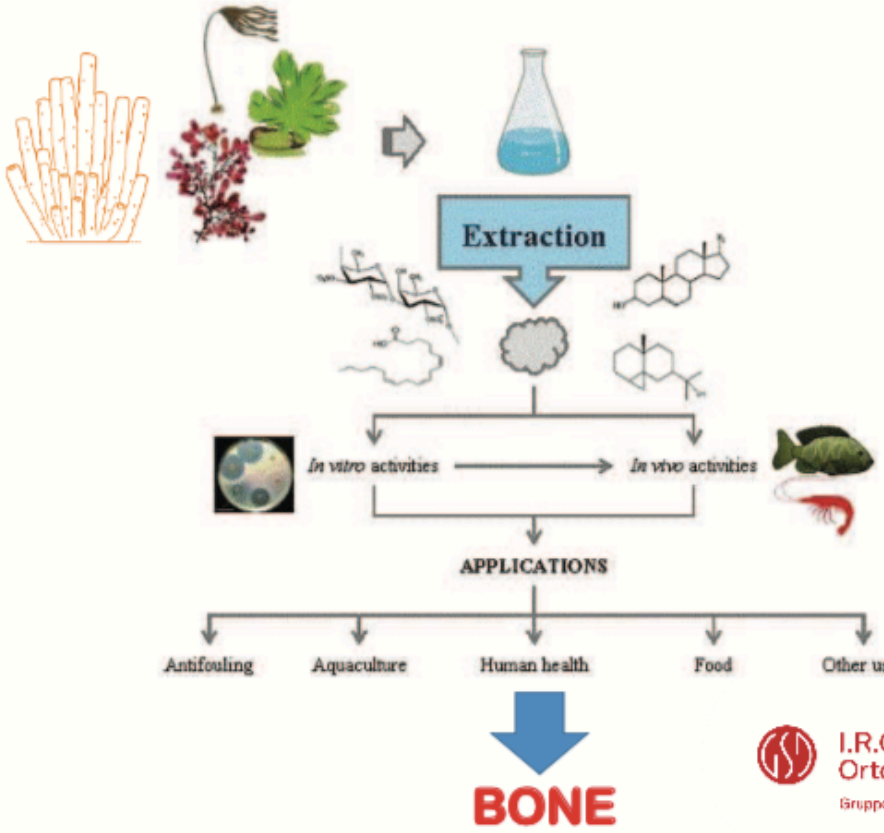
How cancer progresses and responds to therapy is related to intrinsic characteristics of cancer cells, but also to the tumor microenvironment (TME). The TME is a complex ecosystem composed of malignant and nonmalignant cells.
Malignant mesothelioma (MM) is a prototypical example where the inflammatory TME is crucial for development.
Our central hypothesis is that tumor associates macrophages (TAMs) and cancer associated fibroblasts (CAFs) exert a check and balance role in both driving tumor progression and at the same time flagging tumor antigens to the adaptive immune system.
Both activities involve HMGB1; targeting HMGB1 enhances the immunostimulatory activity of TAMs and can mute the immunosuppressive activity of CAFs.

To test our hypotheses, we will use in vitro 3D models of MM to establish a simplified TME and to study the crosstalk between cancer cells, CAFs and TAMs. The crosstalk will be studied alo in a syngeneic mouse model of MM.
Samples will be analysed by flow cytometry, single cell RNA seq and CellChat.

Contact: mezzapelle.rosanna@hsr.it

Marine algae and sponges in bone health

One of the important natural product investigations from marine algae and sponges is to focus on the pharmaceutically important compounds that can be applied in bone health



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Gruppo San Donato

In vivo zebrafish

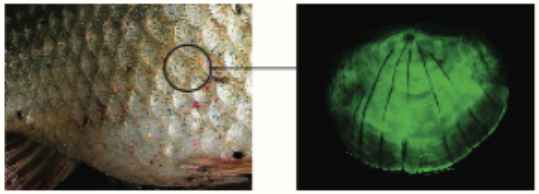
models of bone

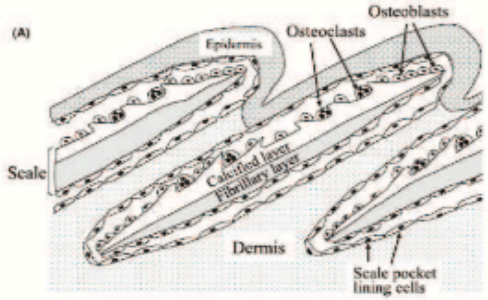
metabolism

EMBRYOS AND ADULTS CAN BE AVAILABLE TO EVALUATE DIFFERENT ASPECTS OF BONE TISSUE: OSTEOGENESIS VS ADULT BONE REMODELLING

ADULT

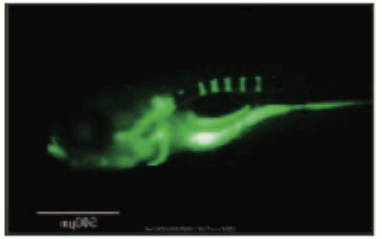
BONE REMODELLING:
the SCALE MODEL





EMBRYO

DEVELOPMENTAL
OSTEOGENESIS



I.R.C.C.S. Istituto Ortopedico Galeazzi
Gruppo San Donato

LIST OF INSTITUTIONS THAT HAVE HOSTED OUR STUDENTS RECENTLY

Austria, Vienna:

- Medical University Vienna: https://www.meduniwien.ac.at/web/en/

Belgium, Bruxelles

- Cliniques Universitaires Saint-Luc: https://www.saintluc.be

Denmark, Copenhagen:

- BRIC https://www.bric.ku.dk
- Danish Cancer Institute: https://www.cancer.dk/danish-cancer-institute/research-groups/

France, Bordeaux:

- Neurocentre Magendie: https://neurocentre-magendie.fr

Norway, Oslo:

- Insitute of Basic Medical Sciences: https://www.med.uio.no/imb/english/

Poland, Krakowia:

- Polish Academy of Sciences: https://pan.pl/en/

Portugal, Porto:

- Insituto de Investigacao e Inovacao em Saude: https://www.i3s.up.pt

Spain:

- **Madrid**: Centro Nacional de Investigaciones Oncologicas (CNIO): https://www.cnio.es
- **Barcelona**: IDIBELL: https://idibell.cat/en/the-institute/

Sweden, Stocholm:

- Karolinska: https://ki.se/en

UK, London: Queen Mary University: https://www.qmul.ac.uk

GERMANY:

- Bonn: https://mediglobus.com/clinic/bonn-university-clinic/
- Bonn: German Centre for Neuroscience: https://www.dzne.de/en/about-us/sites/bonn/
- Köln: https://biochemistry.uni-koeln.de
- Bonn: https://www.ukbonn.de/patient_innen/international/english/information-for-patients/
- Bonn: https://bonn-neuroscience.de/institutions-list/life-brain/
- Bonn: https://ieo.uni-bonn.de
- Bonn: https://www.limes-institut-bonn.de/en/home/

SWITZERLAND:

- **Bellinzona:** https://ior.usi.ch
- **Bern:** https://www.unibe.ch/index_eng.html
- **Lugano:** https://www.eoc.ch/ospedali-e-istituti/istituto-di-neuroscienze-cliniche-della-svizzera-italiana.html
- **Basel:** https://www.unibas.ch/en.html