UNIVERSITÀ POLITECNICA DELLE MARCHE

Supervisor: Dr. Francesca Giampieri

Dept. of Odontostomatologic and Specialized Clinical Sciences
https://www.disco.univpm.it/

Project idea: Effects of plant-based foods on the crosstalk between obesity and colorectal cancer through the use of an organ-on-a-chip system

UNIVERSITÀ POLITECNICA DELLE MARCHE

Supervisor: Dr Francesca Giampieri

Research Group Description: the Supervisor

SUN RISE SMALLER (STRATEGIC) UNIVERSITIES NETWORK FOR REGIONAL INNOVATIVE AND SUSTAINABLE EVOLUTION

HR EXCELLENCE IN RESEARCH

Dr Francesca Giampieri, PhD.

Researcher in Nutrition and Dietetics, DISCO, UNIVPM, at the **Bioenergetic Lab**, a facility based in the Faculty of Medicine, Marche Polytechnic University, Ancona.

Research interest: evaluation of the biological effects exerted by different plant-based foods in different *in vitro* (fibroblasts, breast/colon/liver cancer cells, macrophages, adipocytes) experimental models, with a special emphasis on the diseases related with oxidative stress and inflammation.

Publications: more than 280 peer-reviewed research articles with more than 25,000 citations received (Publication List, H-index = 80 according to Google Scholar; H-index = 68 according to Scopus; H-index = 63 according to Web of Science).

Awards: Named a Thomson Reuters/Clarivate Analytics **Highly Cited Researcher** and listed in the World's Most Influential Scientific Minds from 2019 to 2024.

Involved in several national and international projects.

- European fundings:
  - 2023-2026: "Microbial resources for a sustainable olive oil system and a healthier Mediterranean food: from by-products to functional food" (**PRIMA** project).
  - 2011-2014: "The sustainable improvement of European berry production, quality and nutritional value in a changing environment: Strawberries, Currants, Blackberries, Blueberries and Raspberries" (**H2020**, EUBerry Project: EU FP7 KBBE-2010-4 Grant Agreement No. 265942).

- National fundings:
  - 2024-2025: Protein products based on fermented legumes: from food technology to human health funded by European Commission NextGenerationEU.
  - 2023-2025: Proof of Concept PNRR VALUE "CREMe naturali a base di BERRIES per la protezione della pelle dallo stress ossidativo e dai raggi UV" funded by the Italian Ministry of Economic Development.
  - 2023-2025: "Anthocyanin rich adjuvants against dysbiosis and chronic inflammation in metabolic syndrome patients". PRIN project funded by the Italian Ministry of University and Research.
  - 2020-2022: Proof of Concept "FRAgole Per donne Più Sane – FRAPPE", funded by the Italian Ministry of Economic Development.
  - 2018-2020: "Effect of berry consumption on ovarian cancer prevention: the epigenetic role of dietary polyphenols" (UnivPM Strategic Project).
  - 2013-2015:"Cell cycle aberrations and oxidative stress in age related neurodegenerative disease: The role of food antioxidants" Cooperazione Scientifica e Tecnologica, Ministero Affari esteri, Executive Programme Italy/Republic of Serbia.

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HR EXCELLENCE IN RESEARCH

Bioenergetics Lab

https://twitter.com/Bio_Lab_UNIVPM

STAFF: The group is currently formed by a **full Professor, a Researcher, two post-doc researchers, seven PhD students and two master students.**

RESEARCH ACTIVITY

The main research lines of the Bioenergetic Lab focus on the evaluation of the biological effects exerted by different bioactive compounds present in many food matrices in several *in vitro* (fibroblasts, breast/colon/liver cancer cells, macrophages, adipocytes), *ex vivo* (red blood cells and white blood cells) and *in vivo* (mice, rats and humans) experimental models. Targeted diseases are those related with oxidative stress and inflammation, such as aging, cancer, obesity and cardiovascular diseases, with the aim to highlight the molecular mechanisms involved in the beneficial effects exerted by these food matrices.

EQUIPMENT

Benchtop centrifuges; Chemical hoods; Biosafety 1 and 2 biological hoods; Autoclave; Basic laboratory equipment (analytical balance, freezer, grinder, etc.); Water purification system; Rotavapor; Cell incubator; Microplate reader; Flow cytometry; PCR apparatus; Western Blot system; Seahorse XF Pro Extracellular Flux Analyzer; HPLC; Multimodal microplate reader; Fluorescent microscope.

RESEARCH AND PUBBLICATIONS

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https://orcid.org/0000-0002-8781-3535
https://orcid.org/0000-0003-2772-2225

Dept. Clinical Sciences– DISCO
UNIVPM

UNIVERSITÀ POLITECNICA DELLE MARCHE

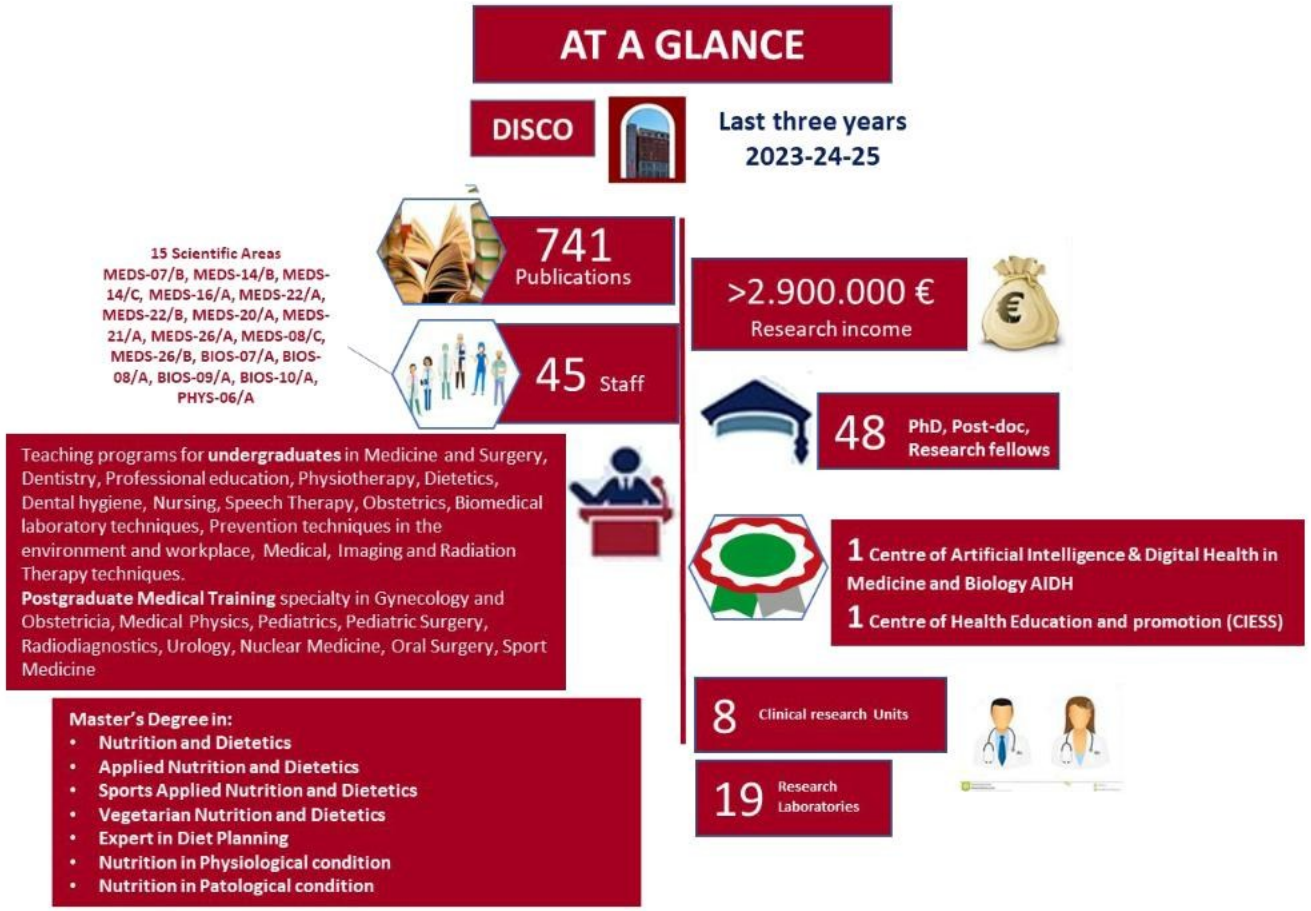
The Department of Odontostomatologic and Specialized Clinical Sciences

Director: Prof. Andrea Giovagnoni

The **Department of Odontostomatologic and Specialized Clinical Sciences** is the scientific and educational organizational structure of the UNIVPM University established in 2008, devoted to the promotion of scientific research, education and the dissemination of scientific research results in the community.

Its main objectives are to plan, organize and regularly evaluate the quality of research activity carried out in the scientific fields and disciplines under its competence; to plan, organize and manage the first-level and master's courses of the Faculty of Medicine; and, finally, to provide cultural and educational activities and contribute to training and orientation activities based on the needs of students in cooperation with the Medical Association.

https://www.disco.univpm.it/



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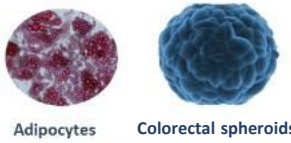
Project Idea: Effects of plant-based foods on the crosstalk between obesity and colorectal cancer through the use of an organ-on-a-chip system

Background: Obesity is one of the major epidemiological problems of the 21st century worldwide. Approximately 30% of the world's adult population is obese and more than 3 million people die every year as result of this illness. Obesity is caused by a sustained imbalance between energy intake and expenditure that leads to an expansion of adipose tissue mass, as well as to a dysregulation of lipid metabolism. In addition, obesity is regarded as one of the key environmental risk factors for the pathogenesis of colorectal cancer, the third most prevalent cancer and the third leading cause of cancer-associated death globally in both men and women from the 1980s. A diet rich in plant-based food has been associated with the inhibition of adipogenesis and the improvement of lipid metabolism, and also with a decreased rick to develop colorectal cancer. However, the effects exerted by plant foods on the crosstalk between obesity and colorectal cancer are still unknow.

Project OBJECTIVES:

The main objective of this project is to evaluate the effects of plant-based foods on an organ-on-chip millifluidic systems, integrating tumour spheroids and adipose tissue components under controlled flow conditions, by assessing the:

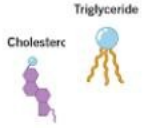
- markers of inflammation
- lipid metabolism
- biomarkers of oxidative stress
- cell death
- markers of tumor cell survival, migration and invasion-associated behavior
- tumor microenvironment
- mitochondrial respiration



Mivo® platform

Evaluation of cell functions:
- Viability assay
- Apoptosis
- Cell cycle
- Intracellular ROS production
- Antioxidant enzymes activities
- Biomarkers of inflammation
- Mitochondrial functionality

Lipid metabolism:
- LDL-cholesterol and TAGs contents
- Lipid peroxidation
- Total lipid accumulation
- Adipokines



Gene and protein expression