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DELLE MARCHE

The effects of plant-based foods on lipid metabolism and adipogenesis

Supervisor: Dr Francesca Giampieri

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

UNIVERSITÀ POLITECNICA DELLE MARCHE

Supervisor: Dr Francesca Giampieri

Research Group Description: the Supervisor

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 230 peer-reviewed research articles with more than 16,000 citations received (Publication List, H-index = 65 according to Google Scholar; H-index = 55 according to Scopus; H-index = 52 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 during the last 5 consecutive years.

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:
  - 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.
  - 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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Bioenergetics Lab

https://twitter.com/Bio_Lab_UNIVPM

***STAFF*: The group is currently formed by a full Professor, a Researcher, a post-doc researcher, five 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.

RESEARCH AND PUBBLICATIONS

https://orcid.org/0000-0002-7250-1782
https://orcid.org/0000-0002-8781-3535
https://orcid.org/0000-0003-2772-2225

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 24 Extracellular Flux Analyzer; HPLC; Multimodal microplate reader; Fluorescent microscope.

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.

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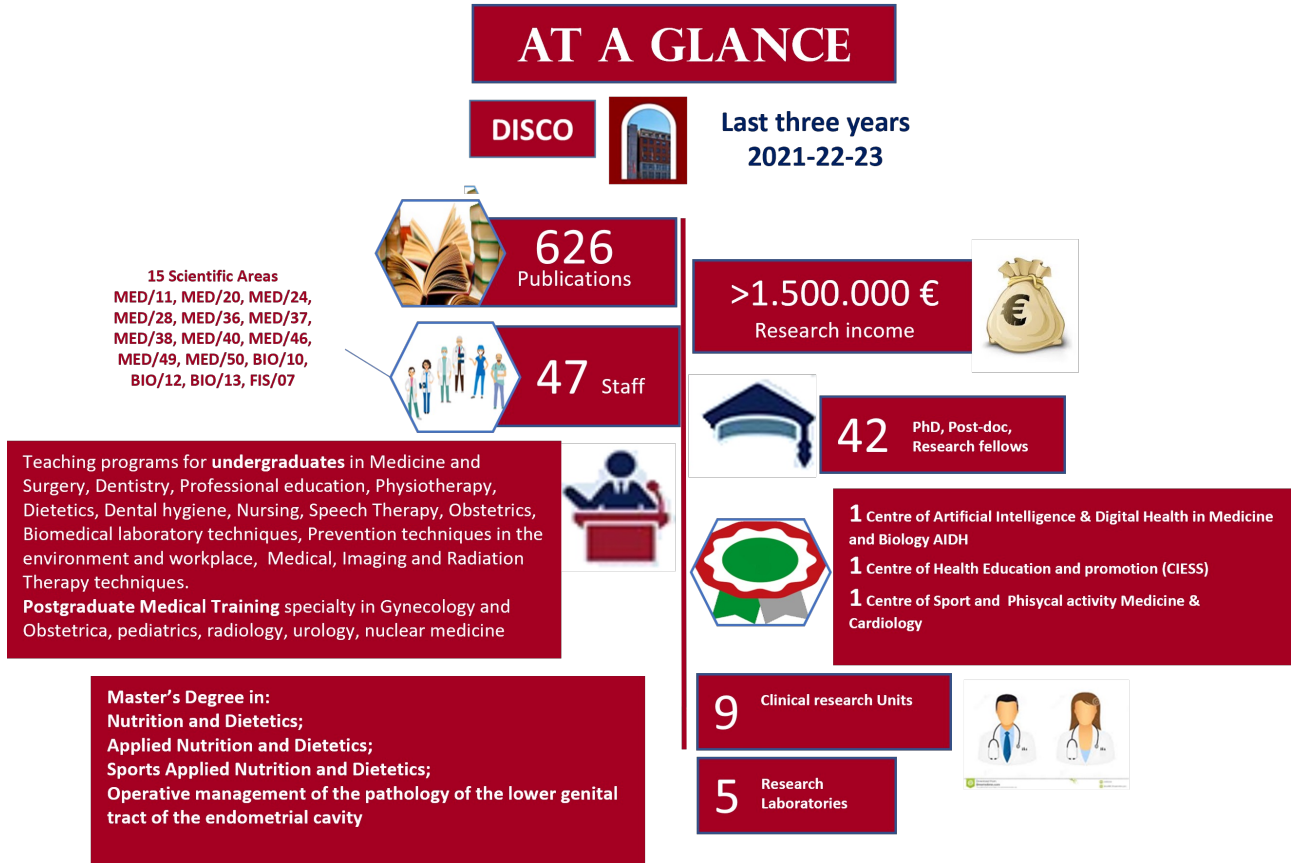

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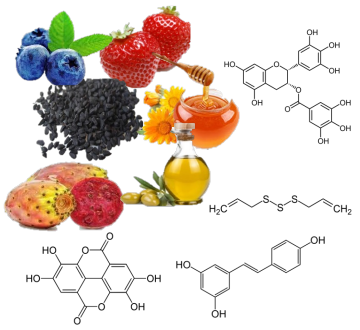
Project Idea: The effects of plant-based foods on lipid metabolism and adipogenesis

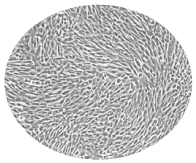
Background: Obesity, which has been associated with many chronic disorders, is one of the major epidemiological problems of the 21st century worldwide. Approximately 30% of the world's adult population is obese (about 2.1billion) and more than 3 million people die every year as result of this illness. It is well known that obesity is caused by a sustained imbalance between energy intake and expenditure that leads to an expansion of adipose tissue mass, the so called adipogenesis process, as well as to a dysregulation of lipid metabolism. Several plant-based foods have demonstrated not only to inhibit adipogenesis but also to ameliorate obesity by increasing thermogenesis, promoting white adipose tissue browning and improving lipid metabolism, but the mechanisms are still elusive.

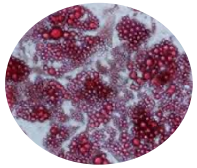
Project OBJECTIVES:
The main objective of this project is to evaluate the effects of plant-based foods on lipid metabolism and adipogenesis in both pre-adipocytes and mature adipocytes by assessing the:

- pre-adipocytes differentiation
- induction of brown fat-like phenotype
- intracellular levels of lipids and the total lipid accumulation
- markers of lipid oxidation
- main biomarkers of oxidative stress and inflammation
- principal molecular pathways involved
- mitochondrial respiration



Pre-adipocytes

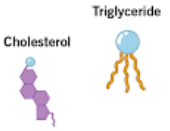




Mature adipocytes

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

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



Gene and protein expression