

Natural Products for Medicinal Chemistry (NPMC Lab)



Prof. Federica Pellati
Associate Professor, P.I.



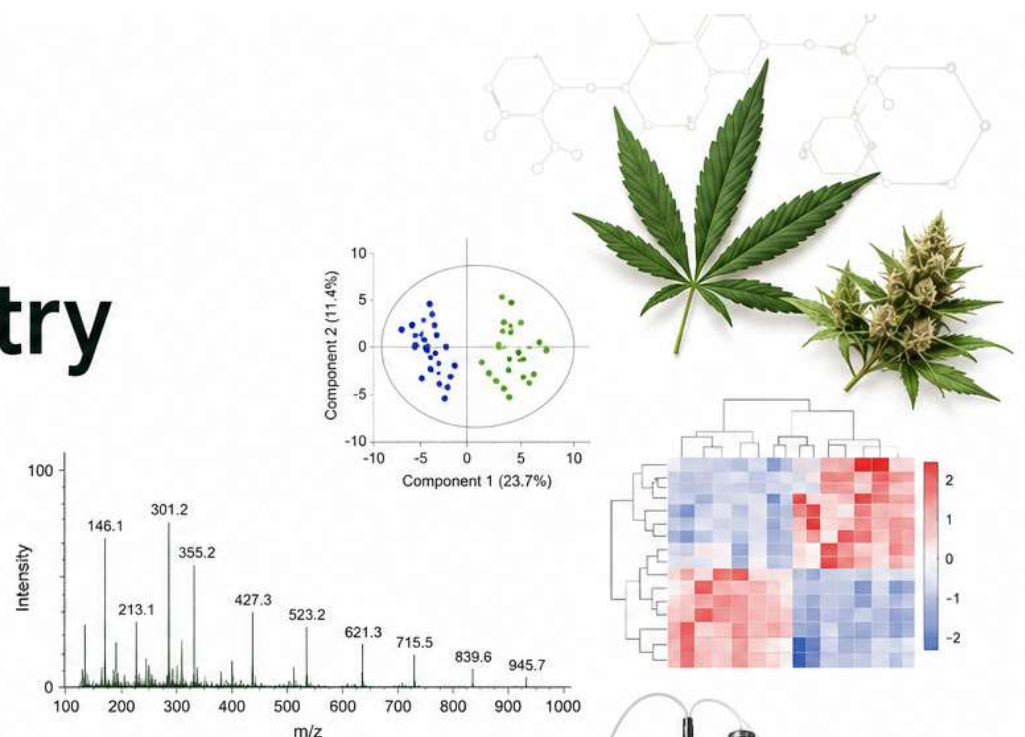
Dr. Virginia Brighenti
research collaborator



Dr. Laura Bertarini
PhD student



Dr. Giulia Bottai
PhD student



BIOLOGICAL SAMPLES



CELLS



BRAIN TISSUE



PLASMA



URINE



TISSUES /
ORGANS



OTHER
BIOFLUIDS
(e.g., CSF, saliva)

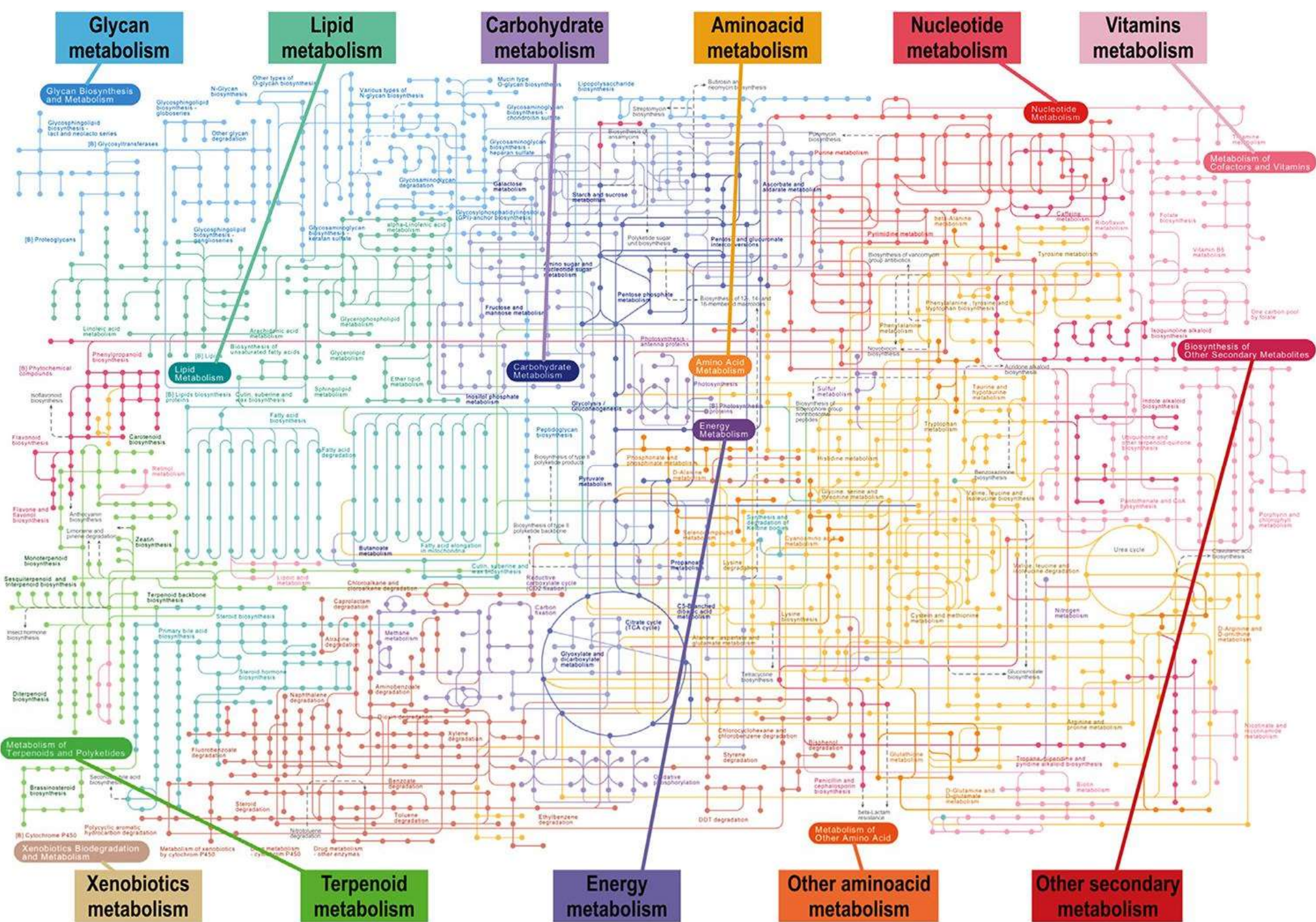


Main research topics

1 Development of new methods for untargeted metabolomics/lipidomics

2 Development of new methods for targeted analysis of compounds in biological matrices (bioanalysis)

3 Identification of natural compounds as new hit/lead for drug discovery by applying an integrated multi-disciplinary approach



Glycan metabolism

Lipid metabolism

Carbohydrate metabolism

Amino acid metabolism

Nucleotide metabolism

Vitamins metabolism

Xenobiotics metabolism

Terpenoid metabolism

Energy metabolism

Other amino acid metabolism

Other secondary metabolism

Understanding biological systems

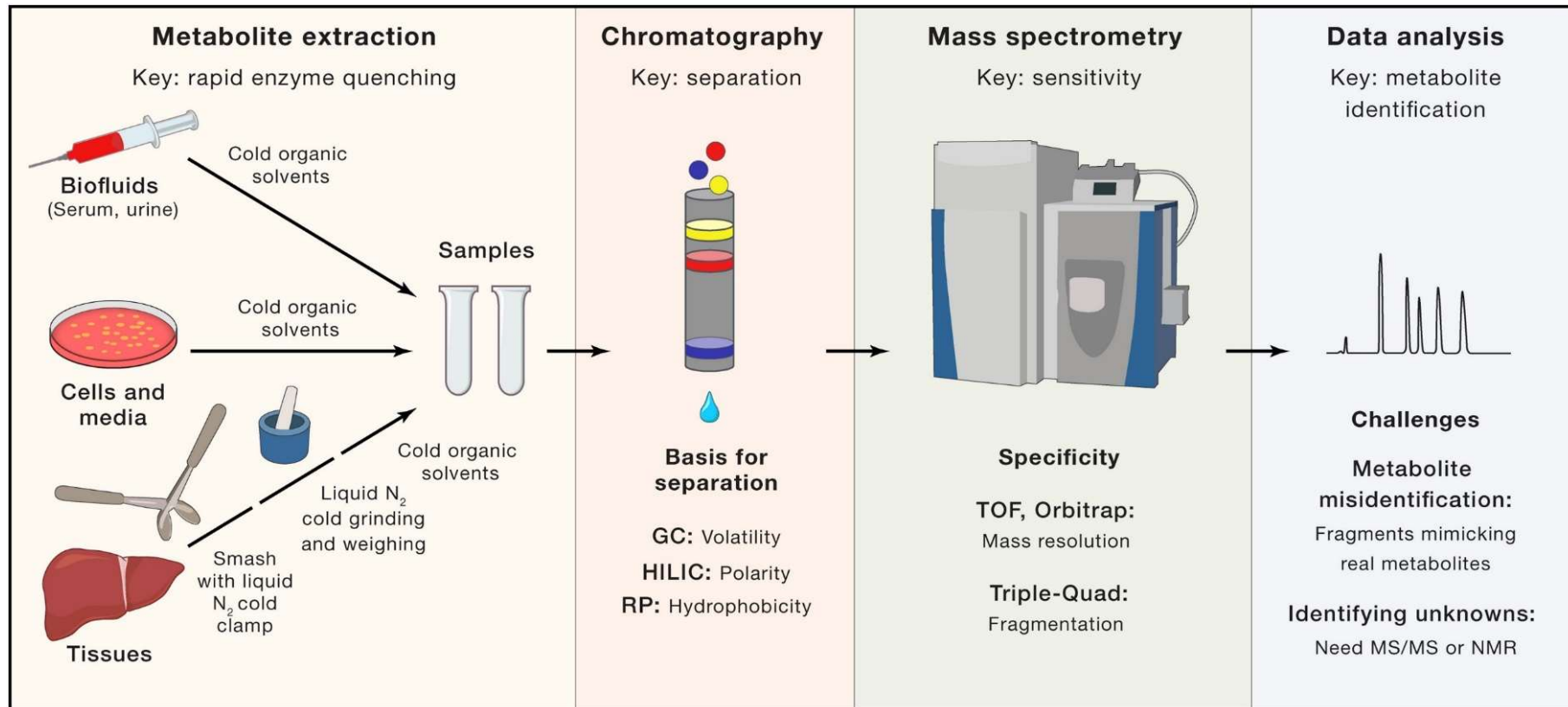
Metabolomics (lipidomics):
Comprehensive measurement of all metabolites and low-molecular-weight molecules in a biological specimen



Targeted

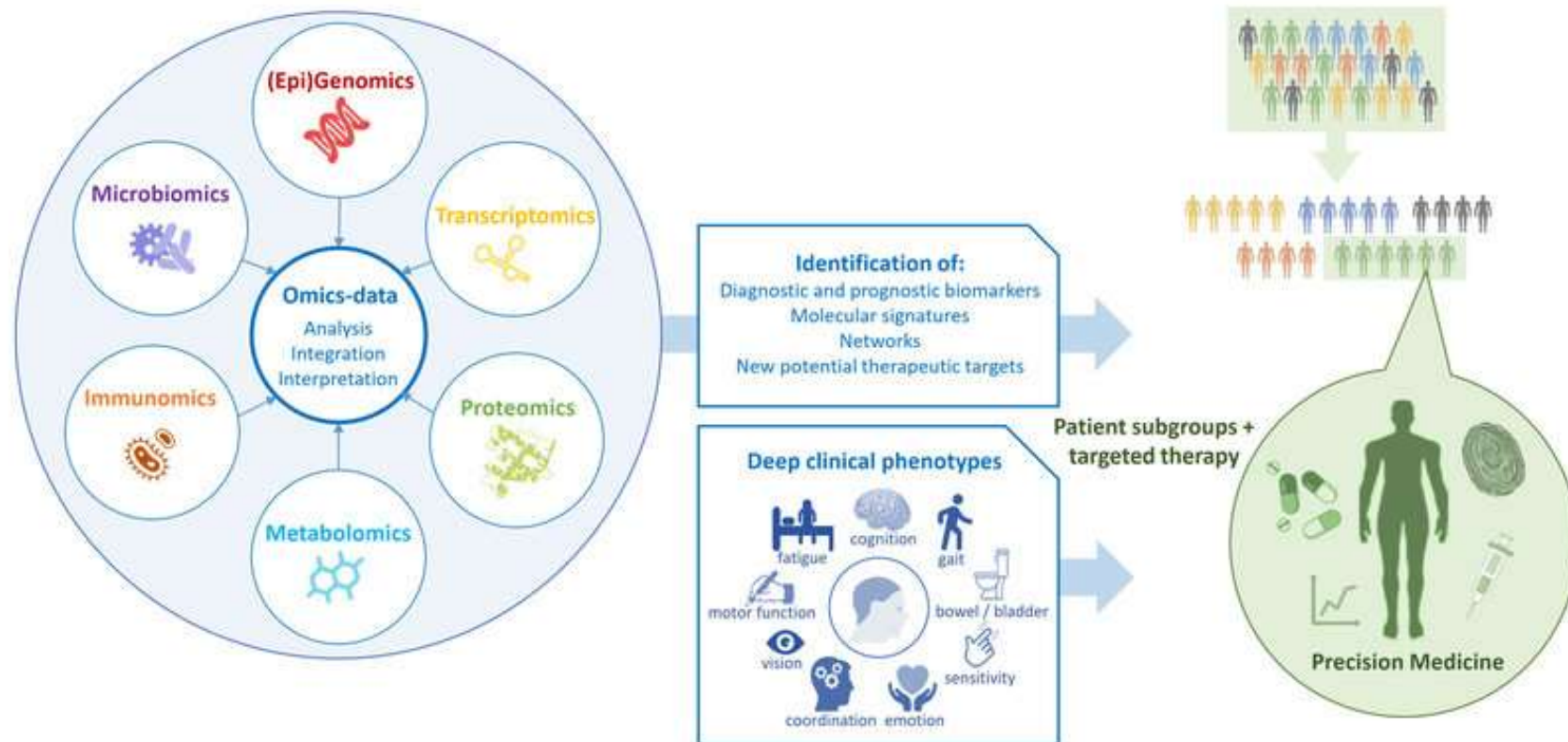


Untargeted



Untargeteted metabolomics

Study on MASH patients to identify new biomarkers of the disease



Finanziato
dall'Unione europea
NextGenerationEU



Ministero
dell'Università
e della Ricerca



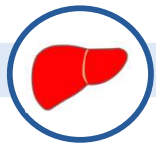
Italiadomani
PIANO NAZIONALE
DI RIPRESA E RESILIENZA



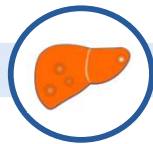
UNIMORE
UNIVERSITÀ DEGLI STUDI DI
MODENA E REGGIO EMILIA

Untargeted metabolomics

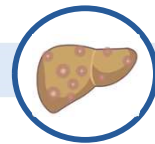
Study on MASH patients to identify new biomarkers of the disease



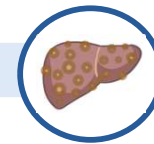
Normal liver



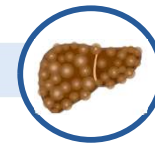
MASLD



MASH



Cirrhosis



HCC

Metabolic dysfunction
Associated
Steatotic
Liver
Disease

5% or more steatosis in the absence of significant alcohol ingestion

MASLD at a glance

Between 30-40%

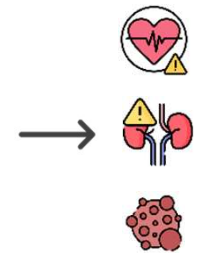
Between 70-90%



- Type 2 diabetes
- Obesity
- Metabolic syndrome

Metabolic dysfunction
Associated
Steato-
Hepatitis

hepatic steatosis with inflammation and hepatocellular injury in the absence of significant alcohol consumption



MASH at a glance

#1 By 2030, MASH will be the most frequent reason for liver transplantation



Only two FDA-approved drugs for MASH treatment



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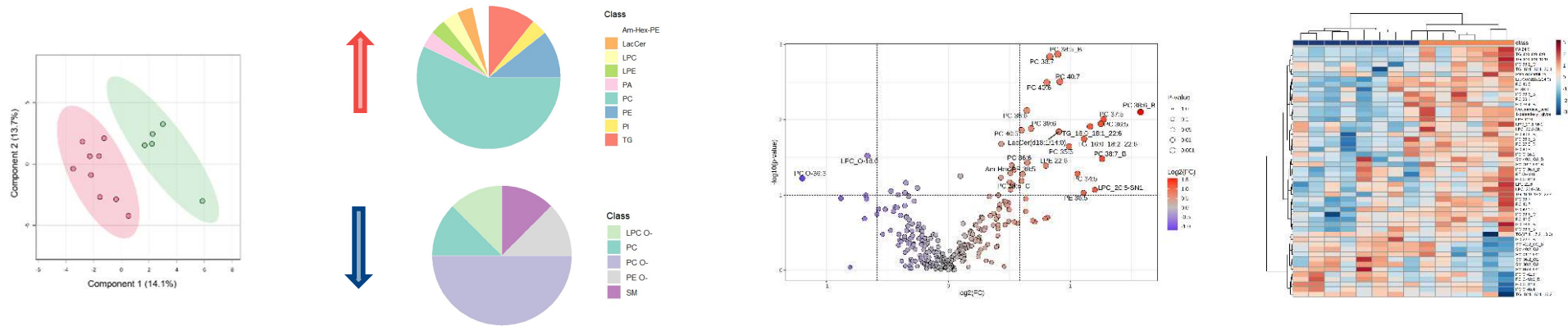
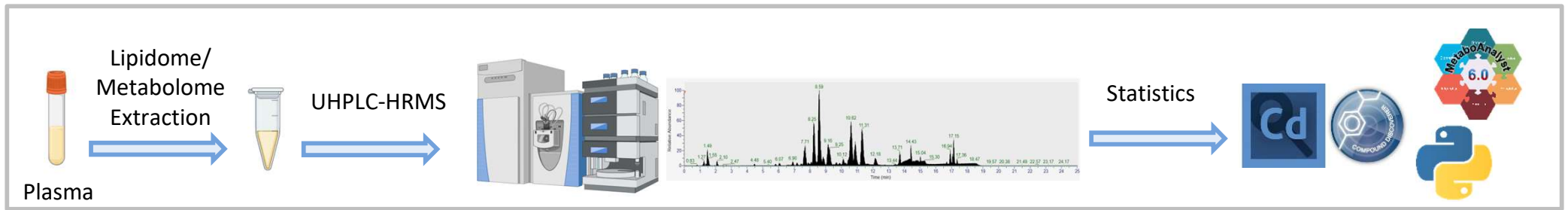
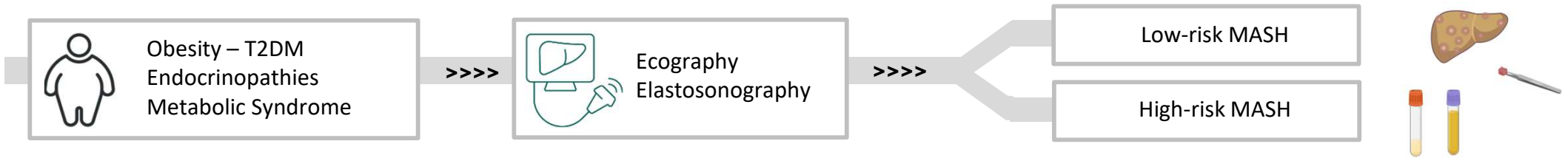
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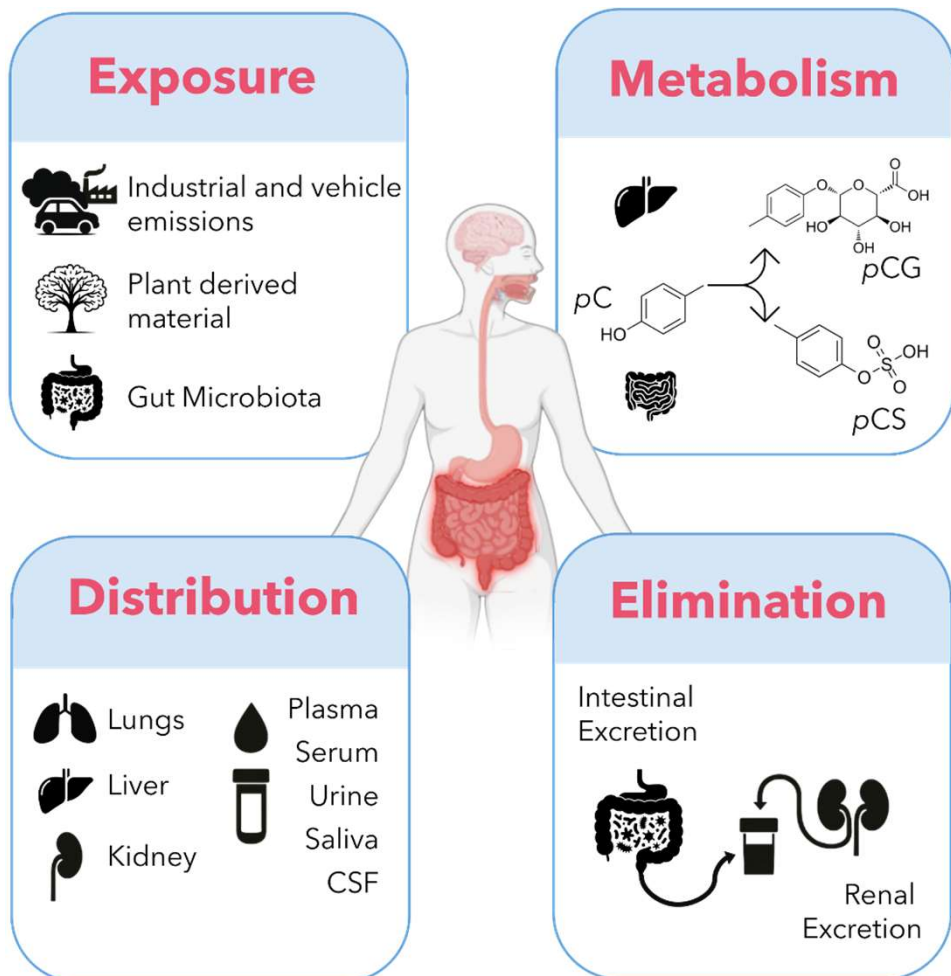
Untargeted metabolomics

Study on MASH patients to identify new biomarkers of the disease



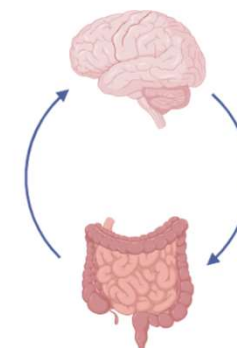
Targeted bioanalysis of *p*-cresol

Study on CNS tissues and cells



- Cardiovascular disease
- Chronic Kidney Disease (CKD)
- Bone health
- Gastrointestinal disorders
- Neurological impairment

Gut-brain axis



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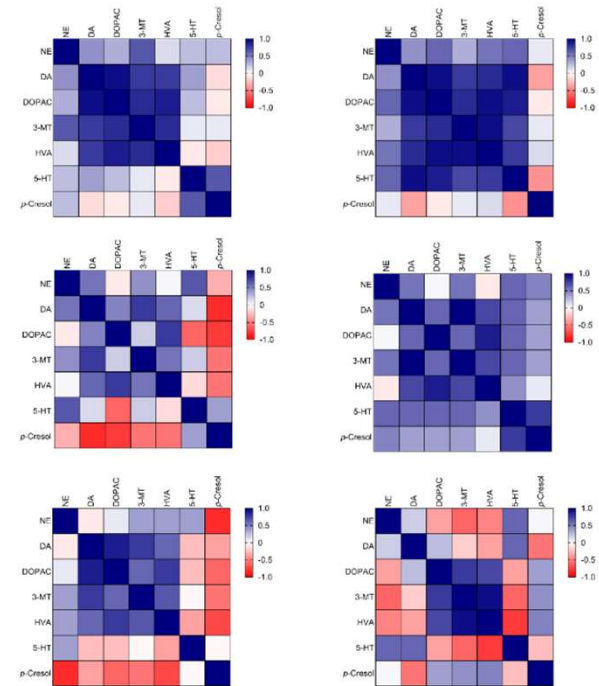
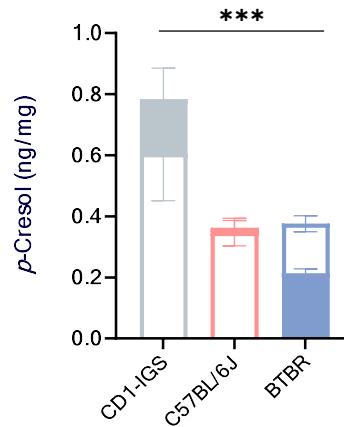
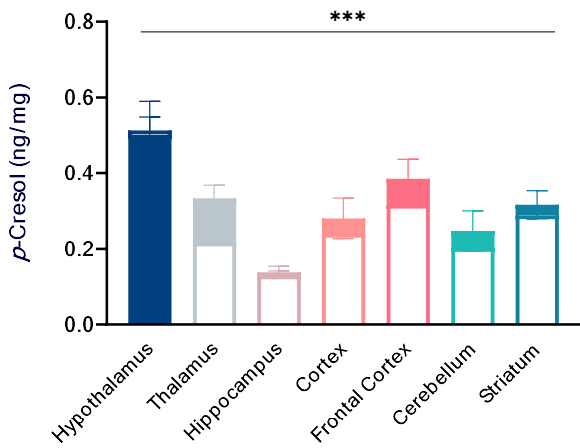
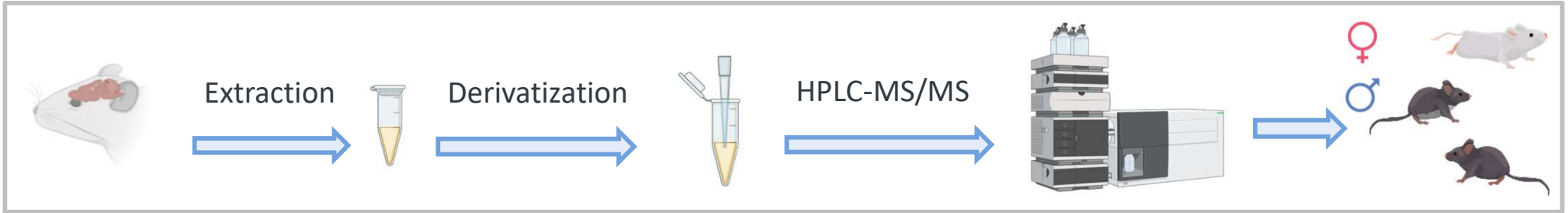
Review

***Para*-Cresol and the Brain: Emerging Role in Neurodevelopmental and Neurodegenerative Disorders and Therapeutic Perspectives**

Laura Bertarini, Federico Imbeni, Virginia Brighenti, Isabella Martusciello, Federica Pellati,* and Silvia Albani*

Targeted bioanalysis of *p*-cresol

Study on CNS tissues and cells

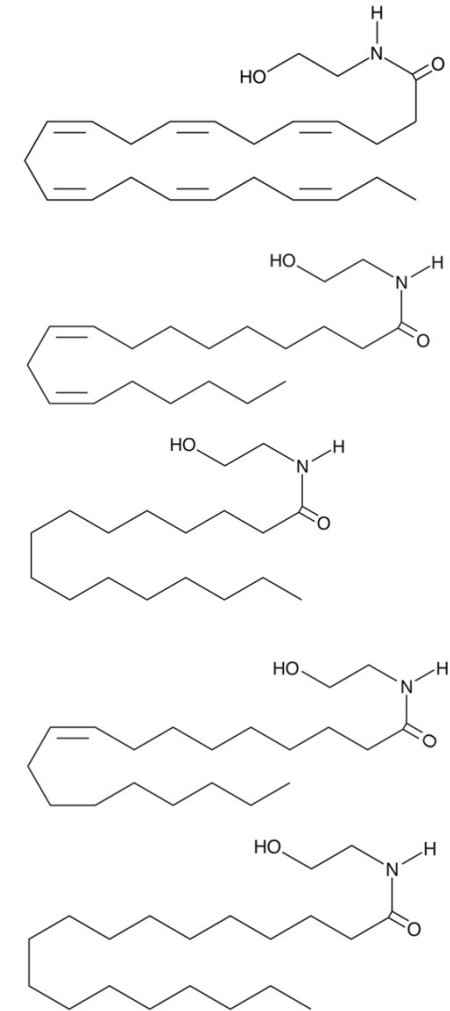
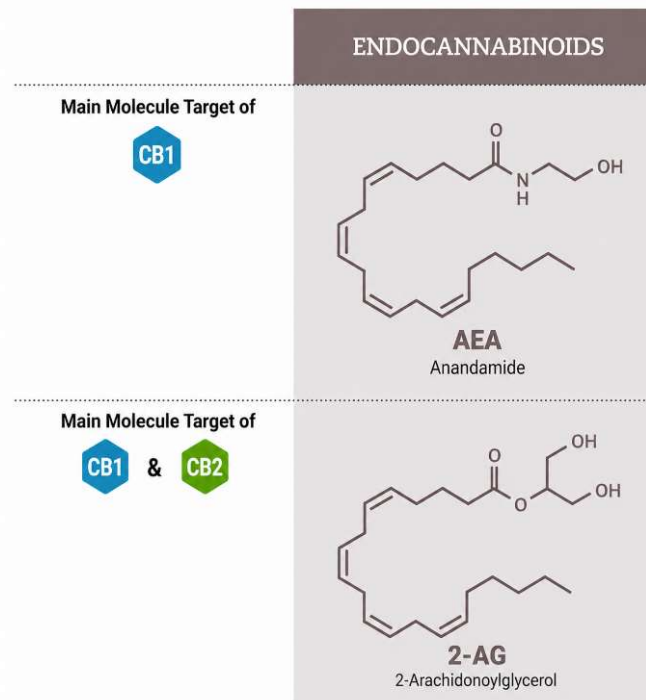
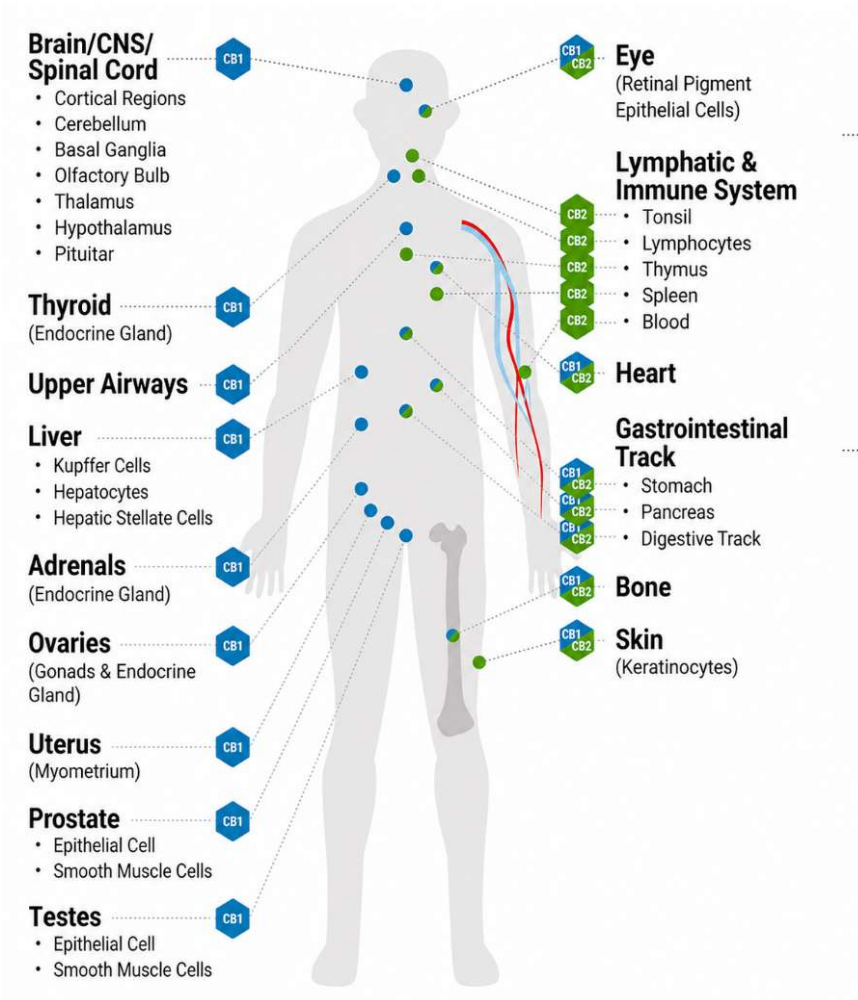


AD models
AD patients
ASD models



Targeted analysis of endocannabinoids

Study on CNS tissues and cells



Targeted analysis of endocannabinoids

Study on CNS tissues and cells



CENTRAL NERVOUS SYSTEM

- Neurotransmission and synaptic signalling
- Neuroprotection and neuroinflammation
- Regulation of stress and behaviour



IMMUNE SYSTEM

- Modulation of immune cell activity
- Regulation of inflammatory responses



METABOLISM and ENERGY BALANCE

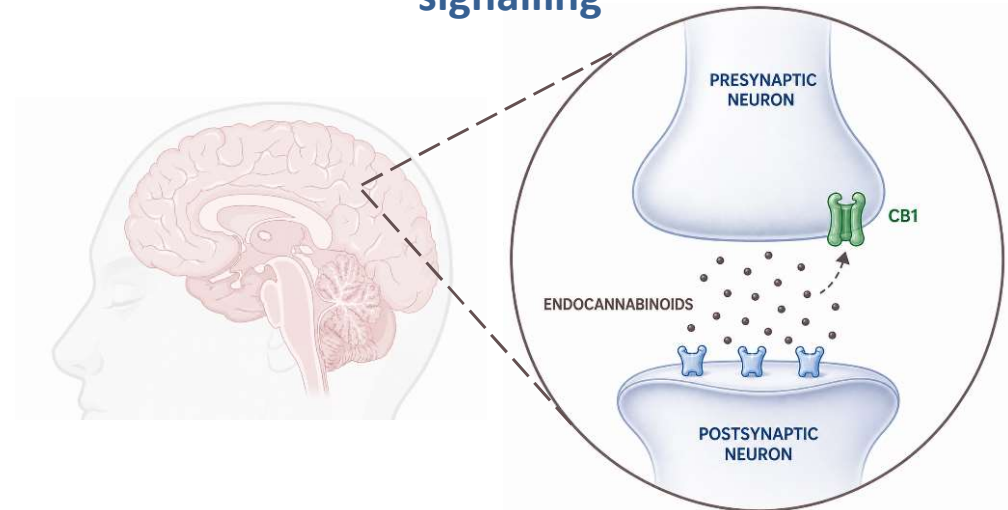
- Appetite and food intake regulation
- Lipid and glucose metabolism
- Involvement in obesity and insulin resistance
- Gut–brain axis



CARDIOVASCULAR SYSTEM

- Regulation of vascular tone
- Cardioprotective mechanisms

The brain as a central target of endocannabinoid signalling



IMPLICATIONS IN CNS DISEASES



Alzheimer's disease



Parkinson's disease



Anxiety and depression

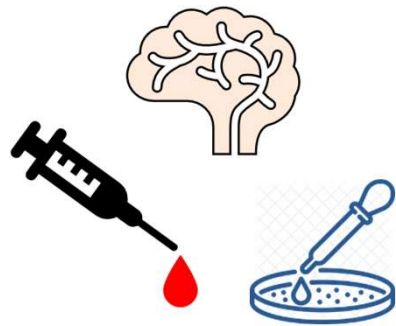


Neurodevelopmental disorders

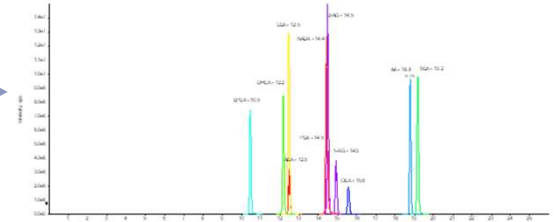
Understanding these roles requires accurate **quantification** of ECs in brain tissue

Targeted analysis of endocannabinoids

Study on CNS tissues and cells

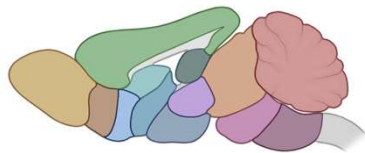


Method optimization



Quantification in brain areas

1



- Amygdala
- Cerebellum
- Hippocampus

Hypothalamus

Prefrontal cortex

Quantification in cells and medium

2



Medium



Cell pellet

Research collaboration

Prof. Federica Pollastro (UNIUPO)

Prof. Daniele Merli (UNIPV)

Prof. Gianni Sacchetti (UNIFE)

Prof. Laura Mercolini (UNIBO)

Prof. Roccaldo Sardella (UNIPG)

Prof. Coral Barbas (CEU-San Pablo University of Madrid, Spain)

**Extraction and
analysis**

Prof. Fabrizio Manetti (UNISI)

Prof. Claudia Mugnaini (UNISI)

***In silico* study
and synthesis**

Prof. Lorenzo Corsi (UNIMORE)

Prof. Silvia Alboni (UNIMORE)

Prof. Antonietta Vilella (UNIMORE)

Prof. Fabio Nascimbeni (UNIMORE)

Prof. Nicoletta Galeotti (UNIFI)

Prof. Celestino Santos-Buelga (University of Salamanca, Spain)

Prof. Victor Lopez Ramos (Universidad San Jorge, Zaragoza, Spain)

Prof. Francesco Tamagnini (Reading University, UK)

Biological activity

Number of experimental thesis for CTF: 2

Number of experimental thesis for Pharmacy: 2

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The whole is more than the sum of its parts
Aristotele