



The First Italian-Israeli Forum on Medicine

Food and health: impact of computational and experimental studies

The Robert H Smith Faculty of Agriculture,
Institute of Biochemistry, Food Science and Nutrition,
The Hebrew University, Rehovot

Foodomics

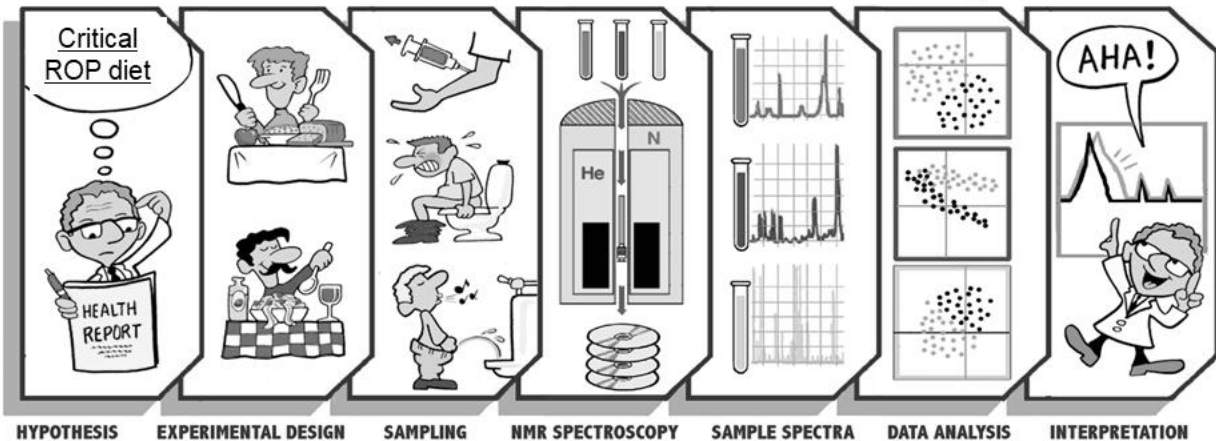
***the right approach to discover the
link between food and health***

Francesco Capozzi
University of Bologna



NUTRITIONAL METABOLOMICS

The workflow of a nutritional metabolomics study



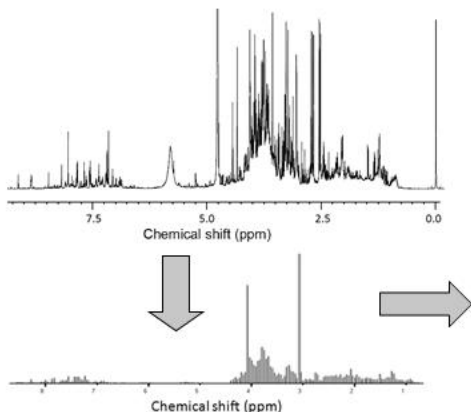
Savorani F. et al. *Food Res. Int.* **54** (2013) 1131–1145

- Assessment of the metabolic consequences of critical diets for populations groups
- Helps to establish biomarkers for healthy or deleterious foods
- Potential to evaluate/develop stratified nutrition to different population groups

SPECTRAL DATABASE

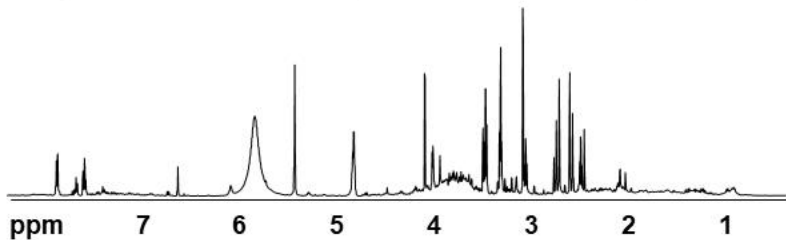
The metabolomic profile of each volunteer refers to the corresponding metadata (nutritional data and life style information).

The NMR database contains the whole binned spectra, each of them consisting of 600 buckets of 0.02 ppm width.

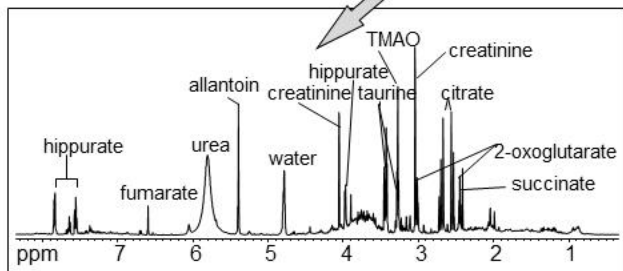


S	M	CODE	TOXIN	SPECTRUM NUMBER	D	E	F	G	H	I	J	K	L	M	N
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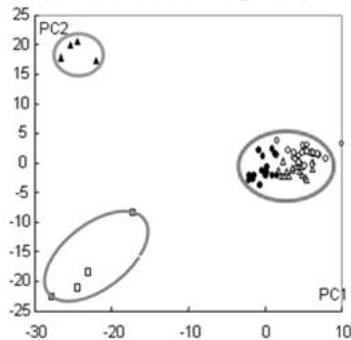
TWO ROUTES TO METABOLOMICS



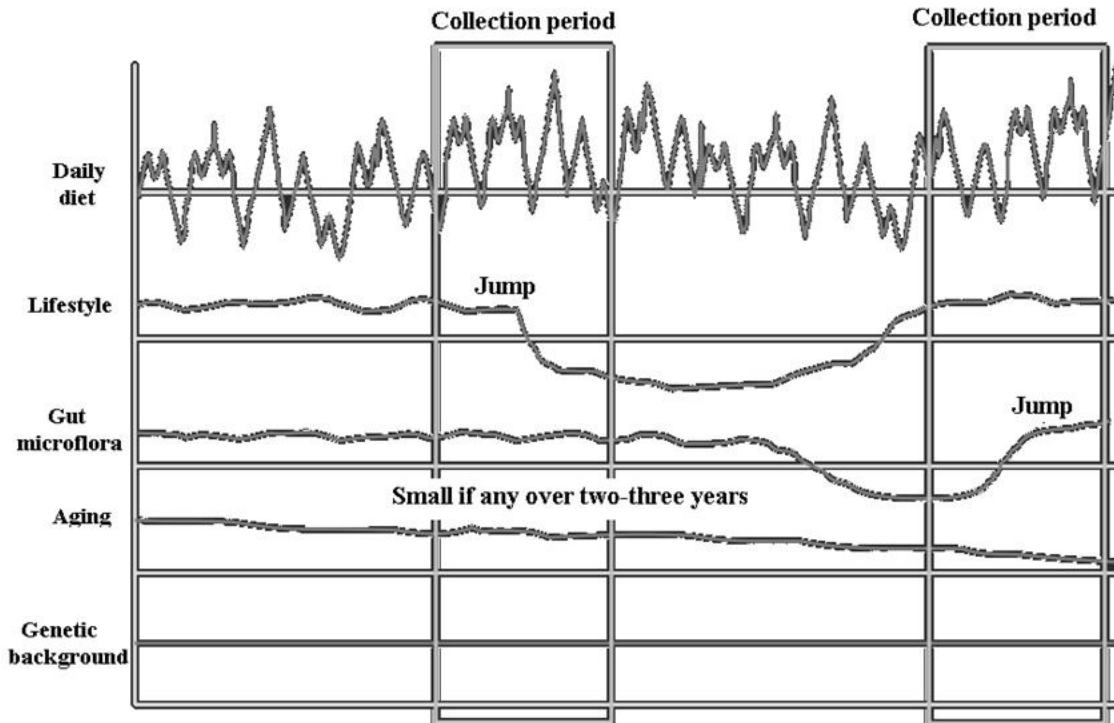
Quantitative Methods (Target Analysis)



Chemometric Methods (Pattern Analysis)

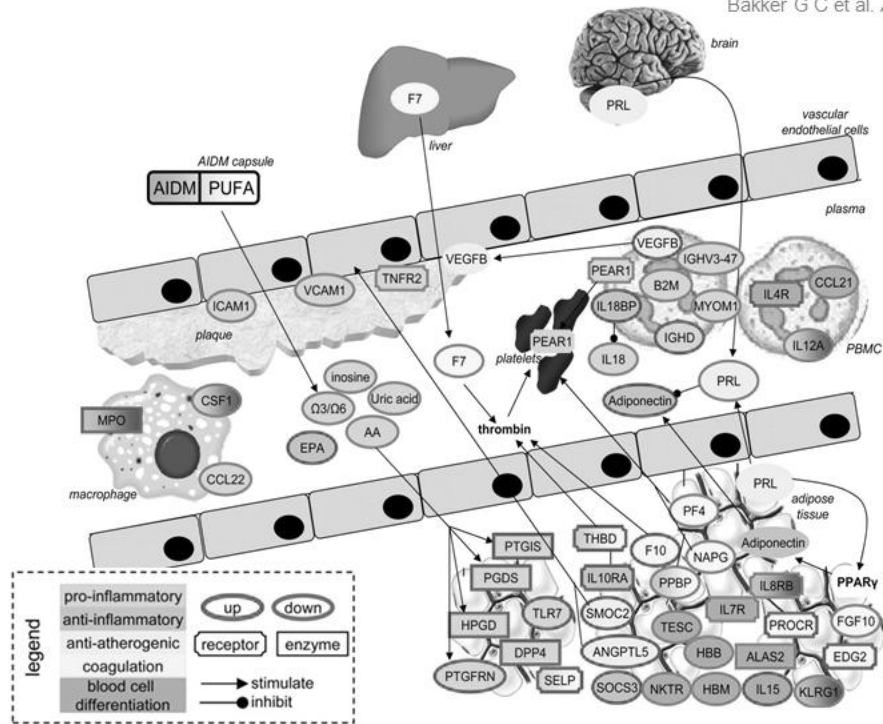


TIME SERIAL DATA FOR METABOLOME



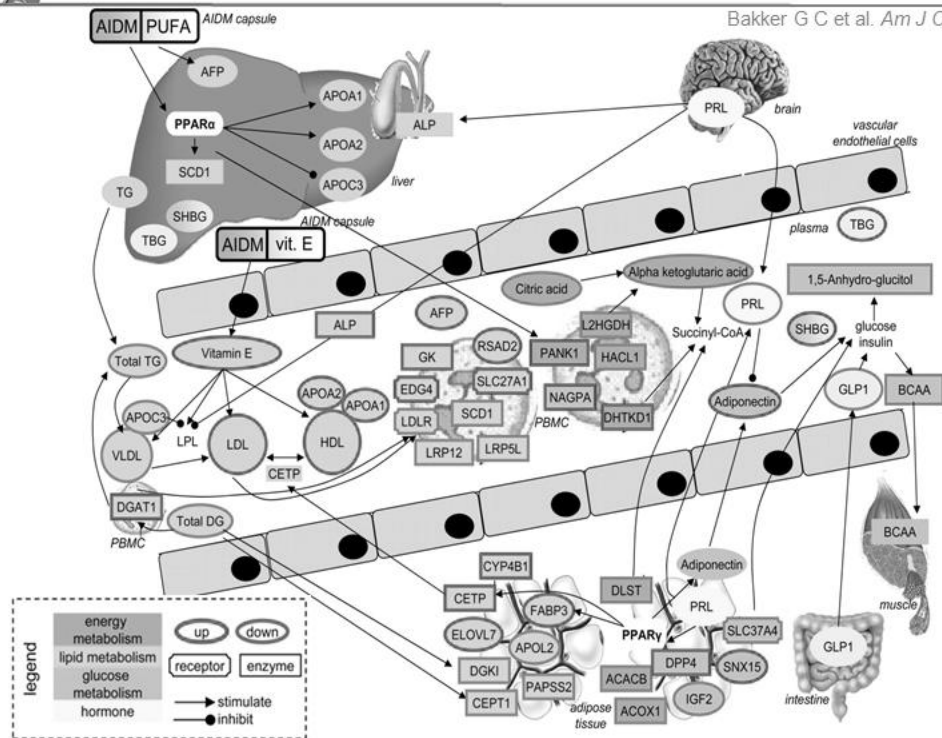
MAIN EFFECTS OF THE AIDM DIET ON INFLAMMATION-RELATED PROCESSES

Bakker G C et al. *Am J Clin Nutr* 91 (2010)1044-1059

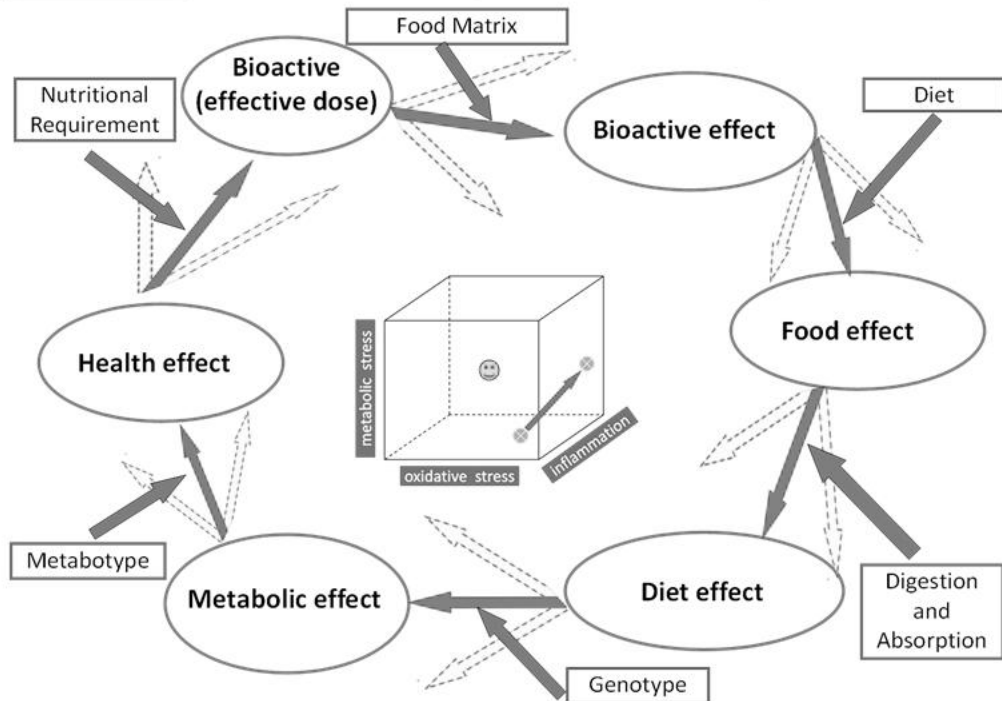


MAIN EFFECTS OF THE AIDM DIET ON METABOLISM-RELATED PROCESSES

Bakker G C et al. *Am J Clin Nutr* 91 (2010)1044-1059



FOOD MODULATION IN THE HEALTH SPACE





CHALLENGES

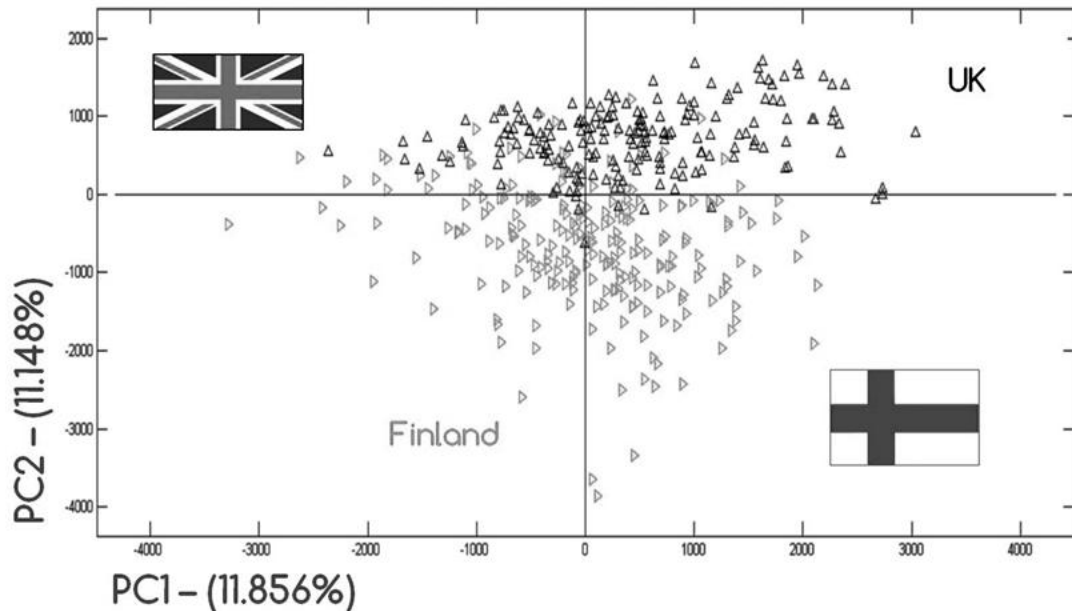
The scientific paradox: Difficult to define health in absence of disease: what to measure?

The genotype paradox: "One size does not fit all" – we are all genetically different in our response to diet and lifestyle – but dietary recommendations are targeted to populations

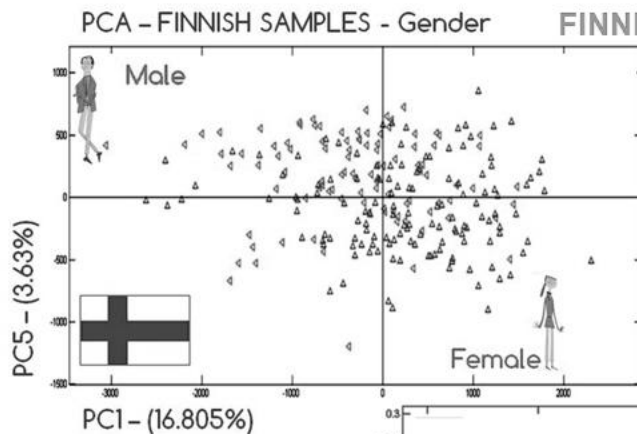
The data paradox: Too much data too little information!

DIFFERENCES DUE TO POPULATION

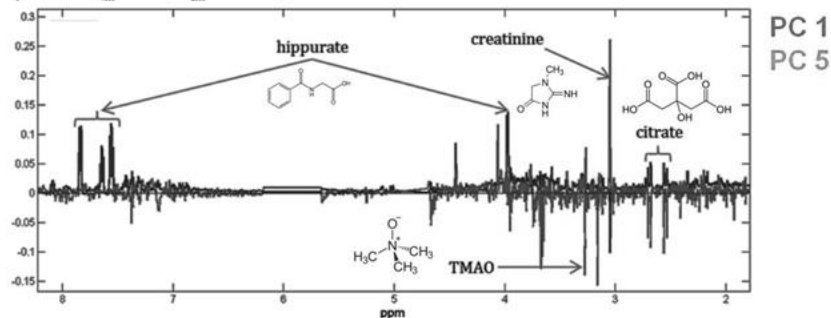
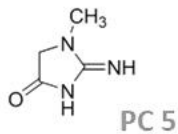
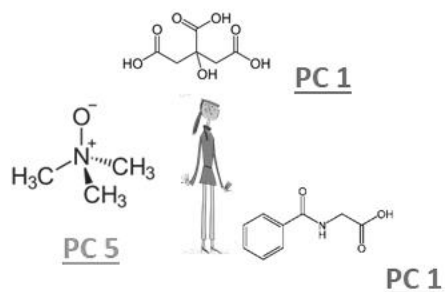
PCA - GLOBAL MODEL - Finland vs UK



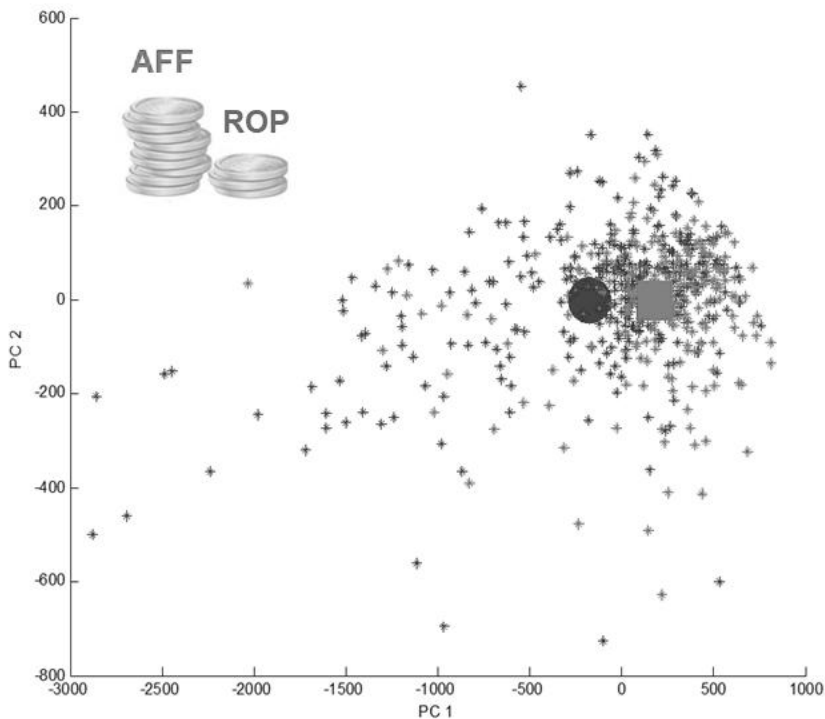
DIFFERENCES DUE TO GENDER



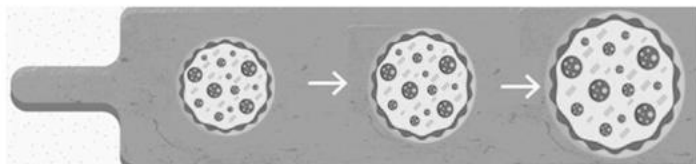
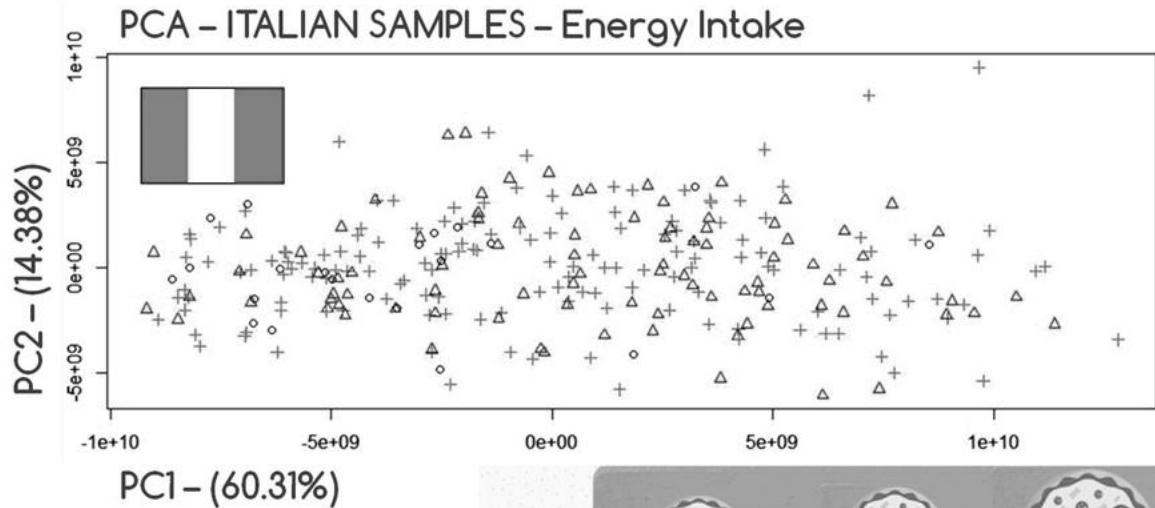
FINNISH SUBJECTS



ASCA ANALYSIS - PRELIMINARY RESULTS

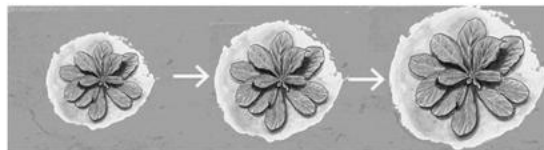
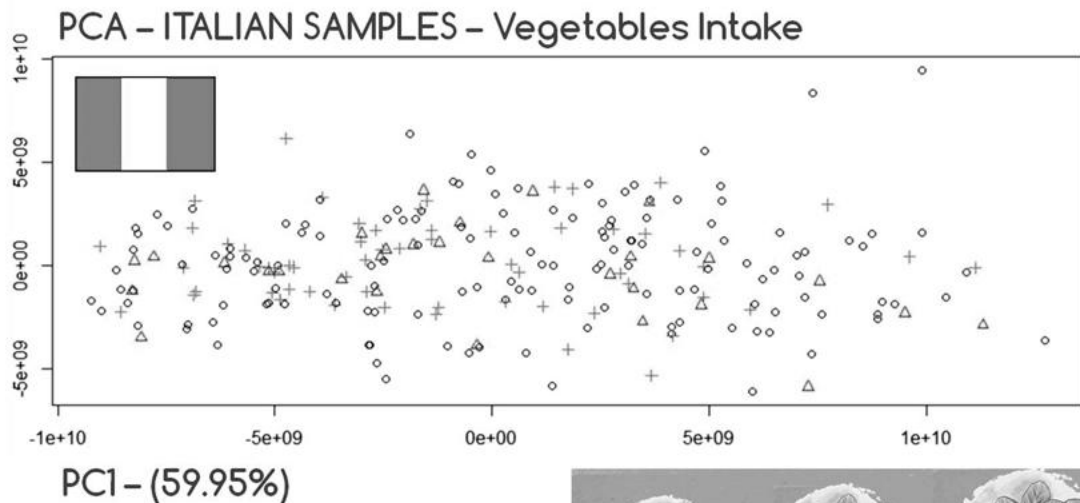


LOOKING FOR THE EFFECT OF DIET (DIFFERENT ENERGY INTAKE)



< 1200 kcal 1200-2000 kcal > 2000 kcal

LOOKING FOR THE EFFECT OF DIET (DIFFERENT VEGETABLES INTAKE)



0 g



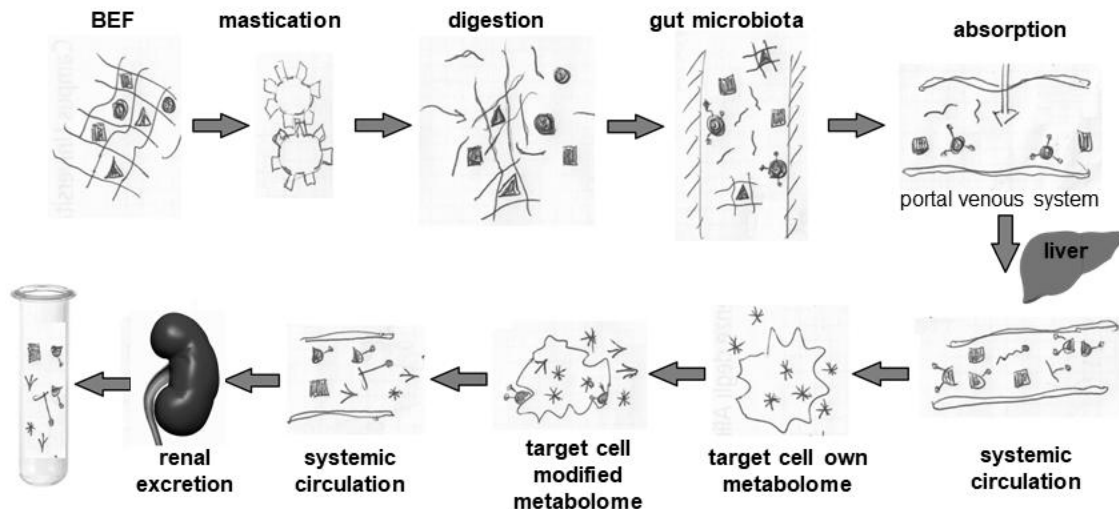
0-50 g



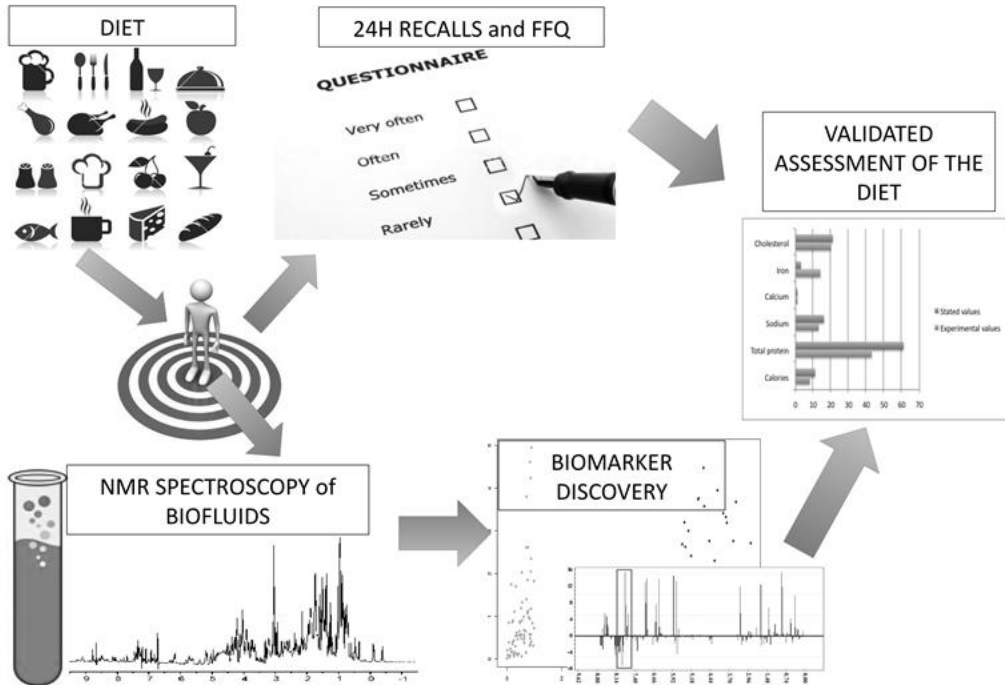
>50 g



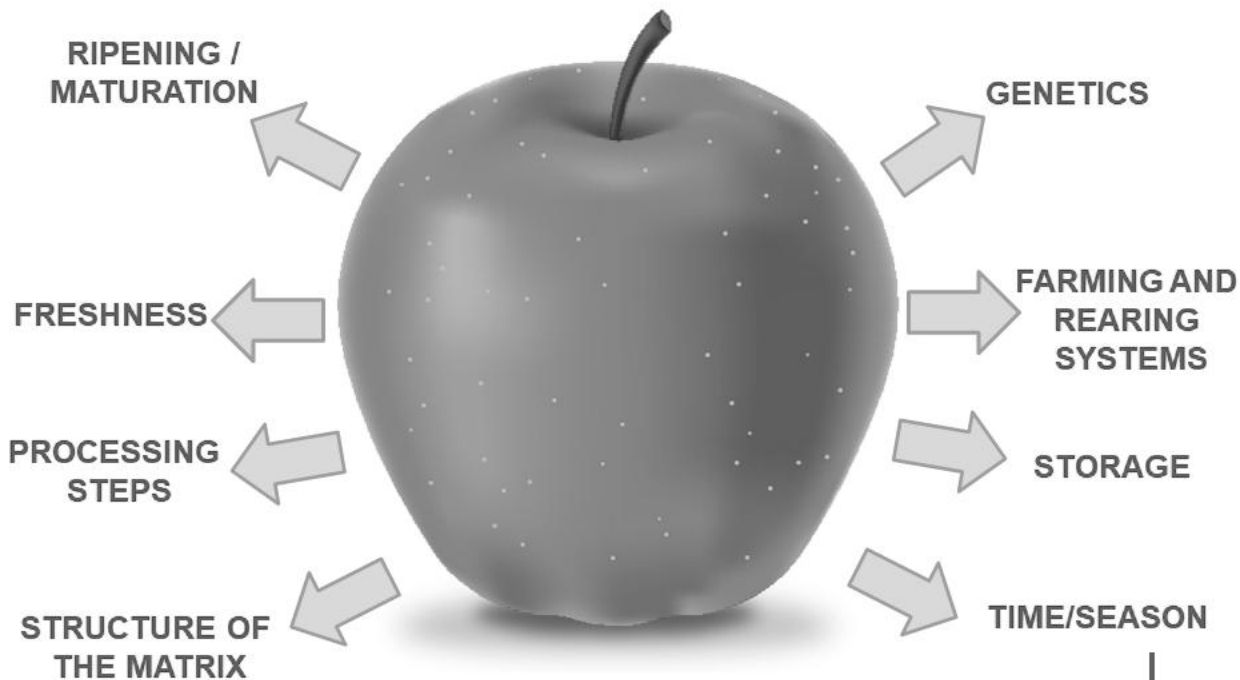
FROM BIOACCESSIBILITY TO EXCRETION



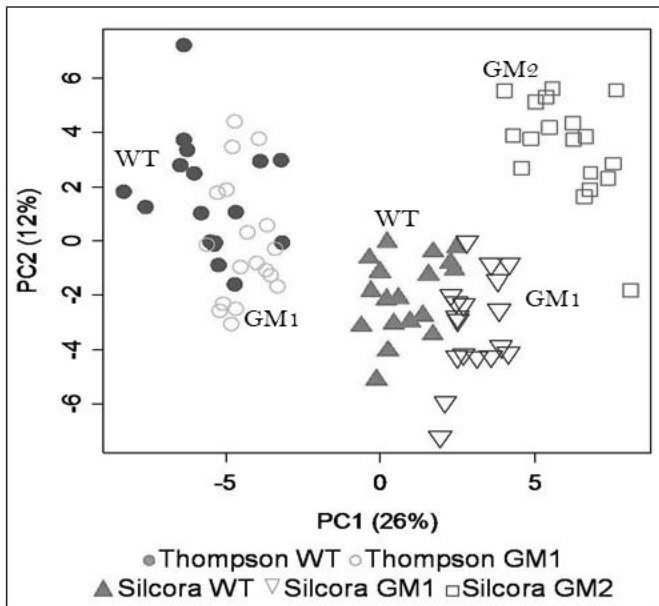
LOOKING FOR VALIDATION OF THE DIETARY ASSESSMENT



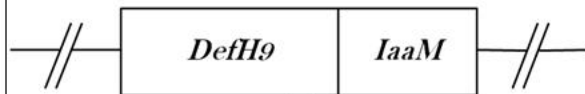
FACTORS AFFECTING THE FOOD QUALITY



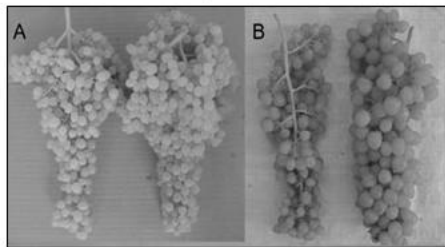
GENETICS OF GRAPE BERRIES (GMOs)



The Genetically Modification
The *DefH9-iaaM* gene
(Mezzetti et al., 2004)

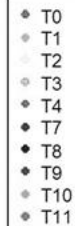
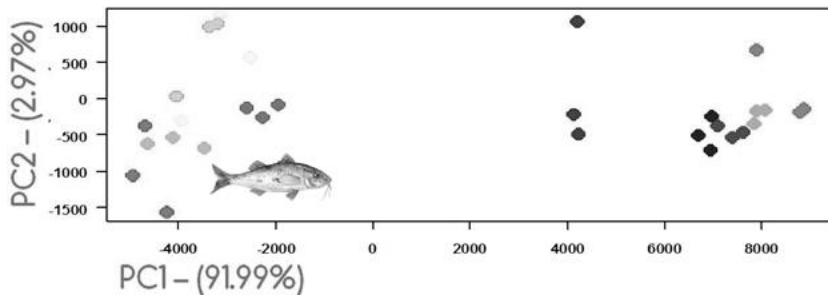


Increase the number of
berries per bunch

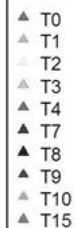
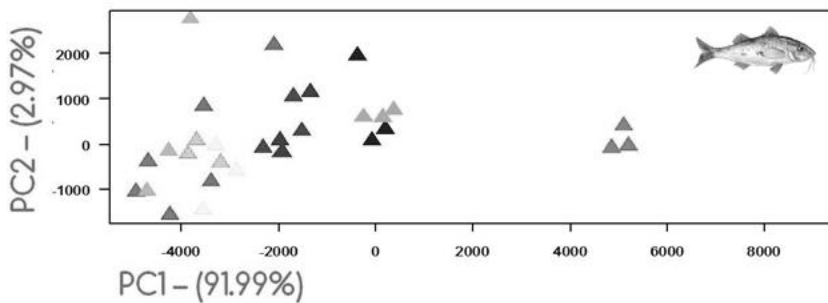


EFFECT OF FRESHNESS ON MULLET

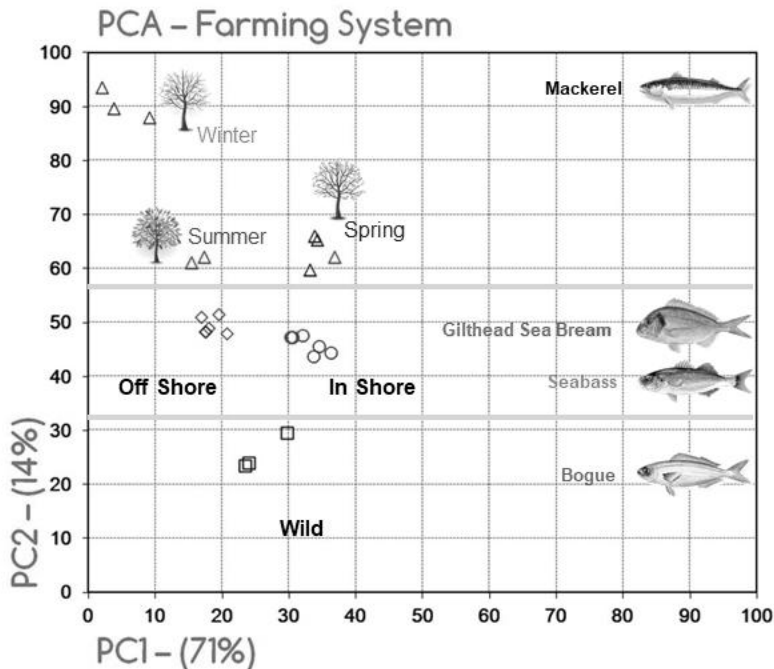
4°C



0°C



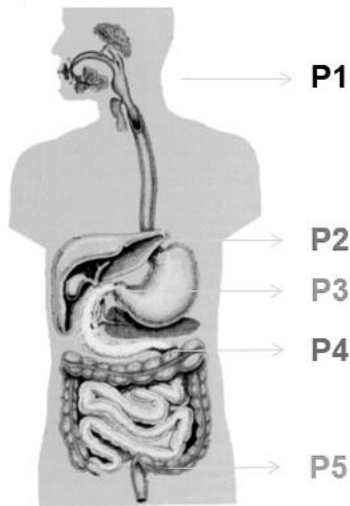
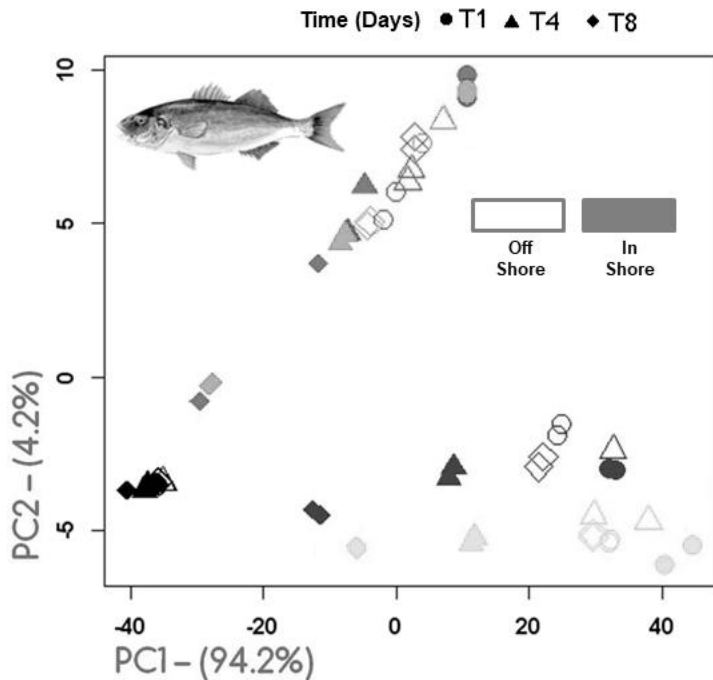
EFFECTS OF SPECIES, SEASONS AND FARMING SYSTEM



Seasons effects on Mackerel samples

Farming effects on Bogue, Sea bass and Gilthead Sea Bream samples

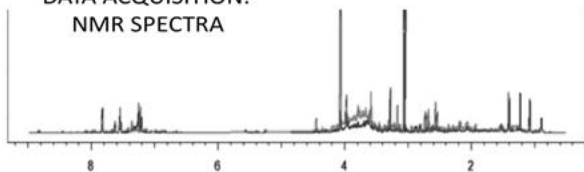
DIGESTION OF SEA BASS REARED IN DIFFERENT AQUACULTURE SYSTEMS



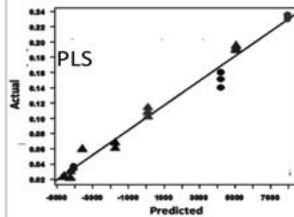
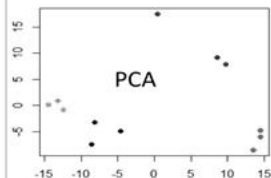
DESCRIBING FOOD IN DETAIL



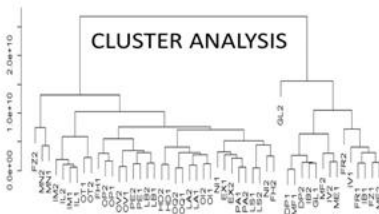
**DATA ACQUISITION:
NMR SPECTRA**



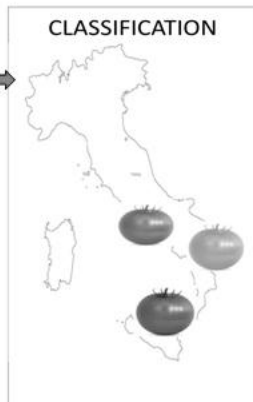
**DATA
ANALYSIS**

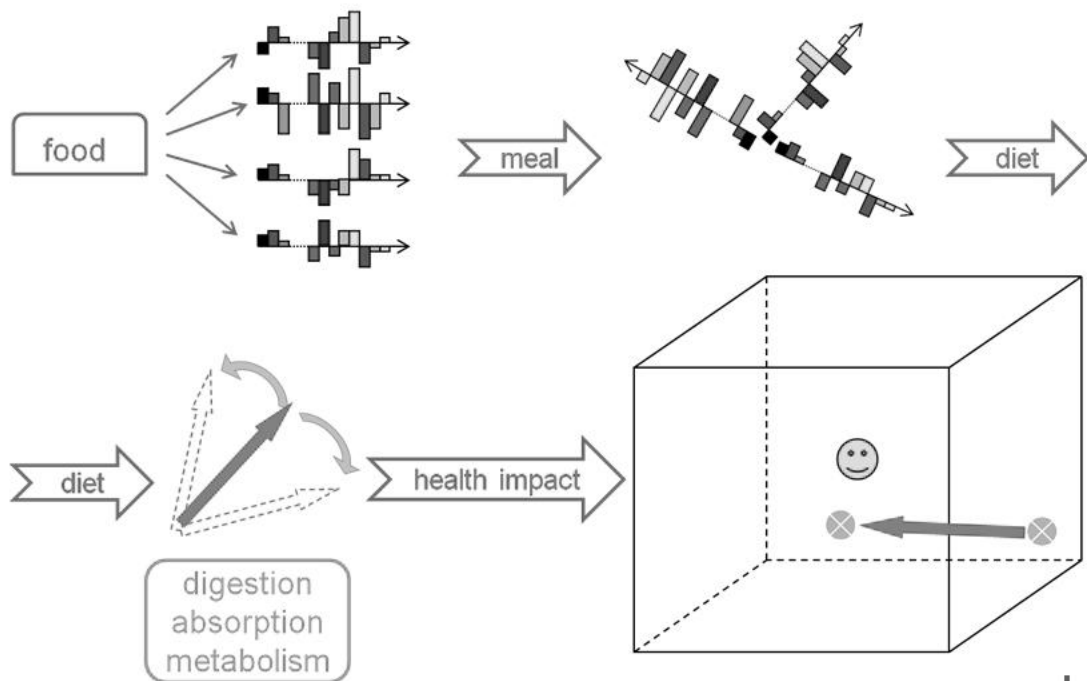


CLUSTER ANALYSIS



CLASSIFICATION





DESCRIBING FOOD IN DETAIL



F. Capozzi, A. Trimigno
**Using metabolomics to
describe food in detail (Ch. 11)**

J. L. Sebedio, L. Brennan (Eds.)
ISBN 978-1-78242-084-2



Foodomics: the right approach to discover the link between food and health



THANK YOU FOR YOUR KIND ATTENTION

Bio-NMR

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