



DIETA MEDITERRANEA E MODULAZIONE DEL MICROBIOTA

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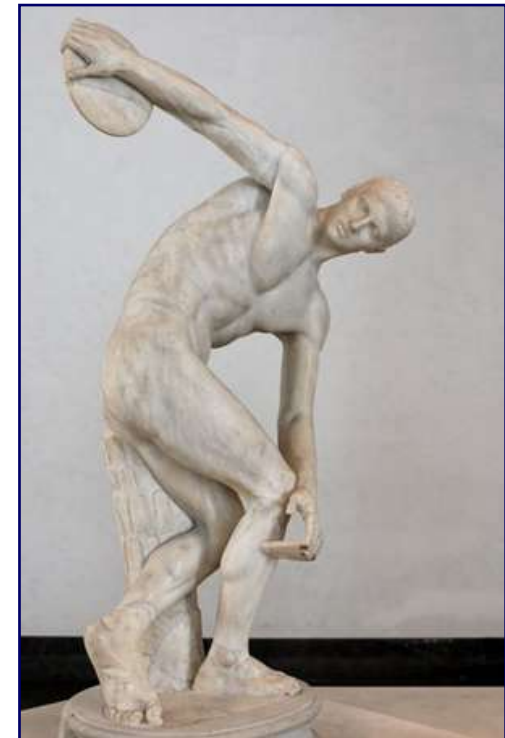
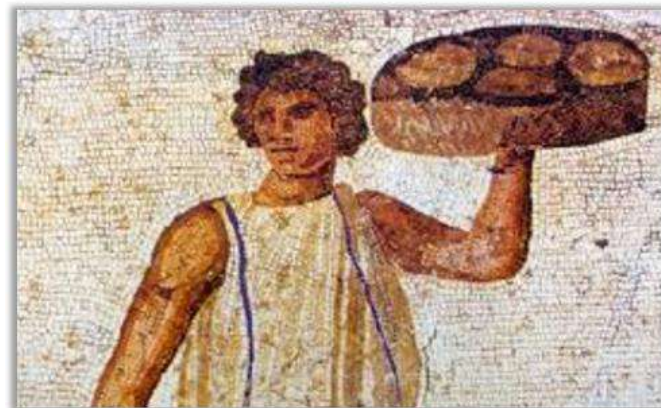
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Dipartimento di Medicina Sperimentale

THE CONCEPT OF DIET



The concept of Diet was introduced by Ippocrate di Cos in IV century b.C. With his work

“Regime of life” “διαίτα”



NUTRITION

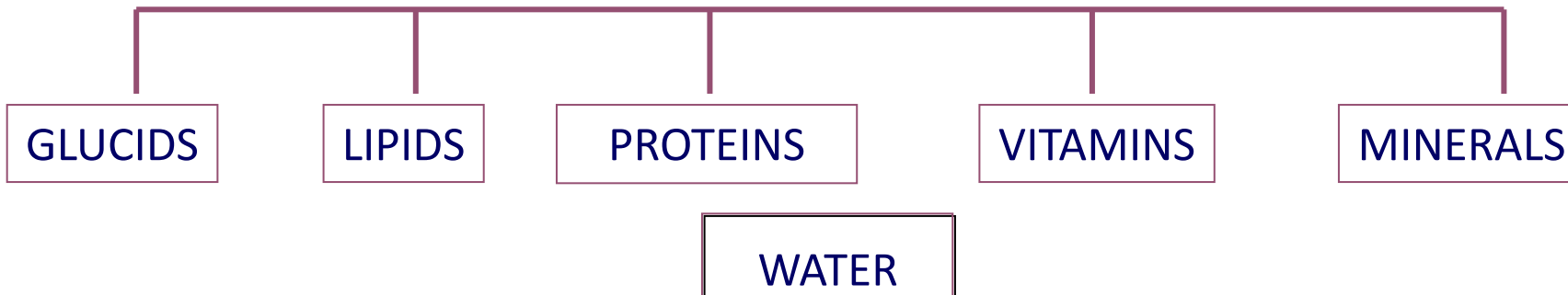
FOOD



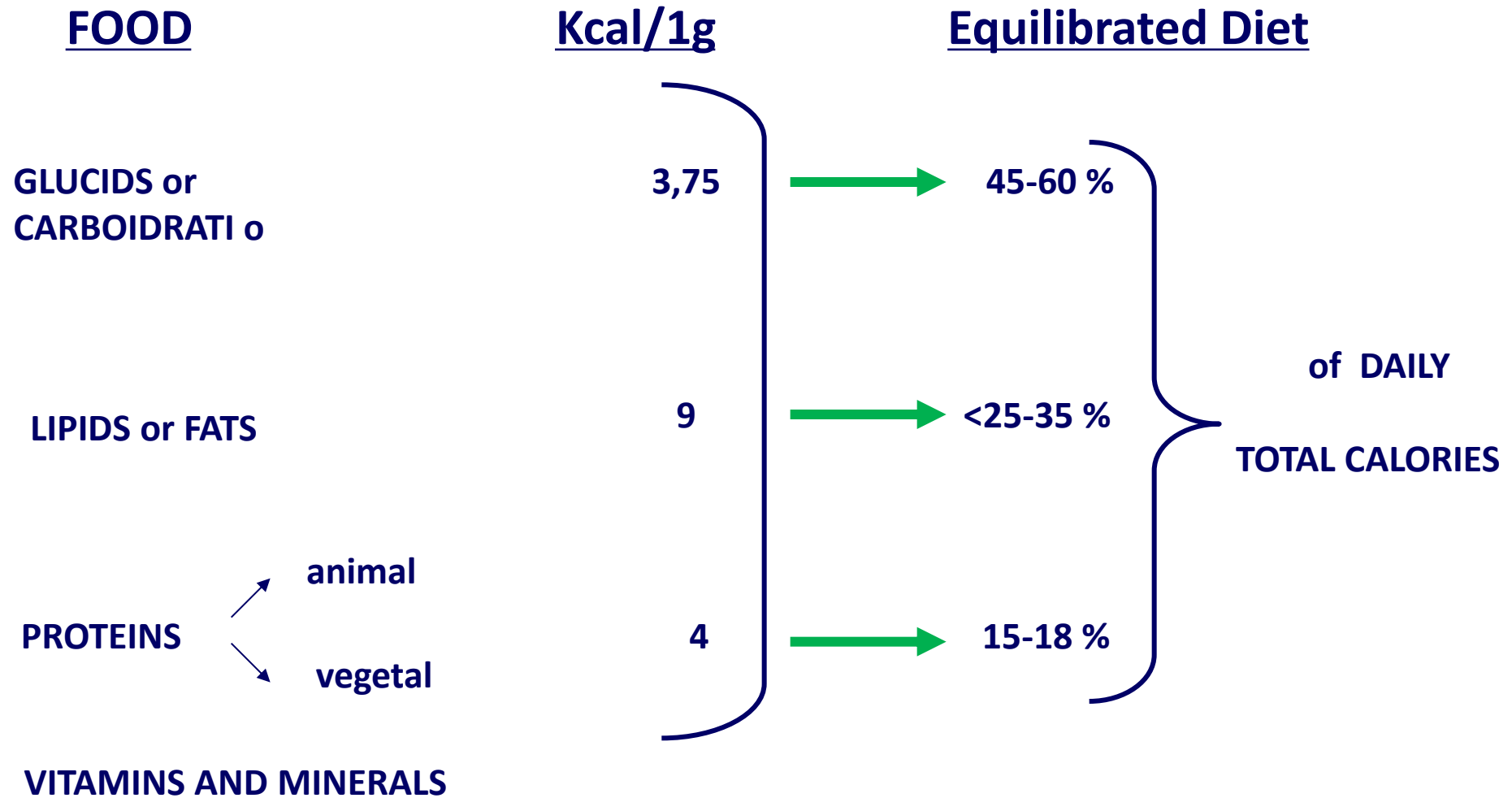
NUTRIENTS



Substances with specific functions in human body.
They contribute to wellness maintenance.



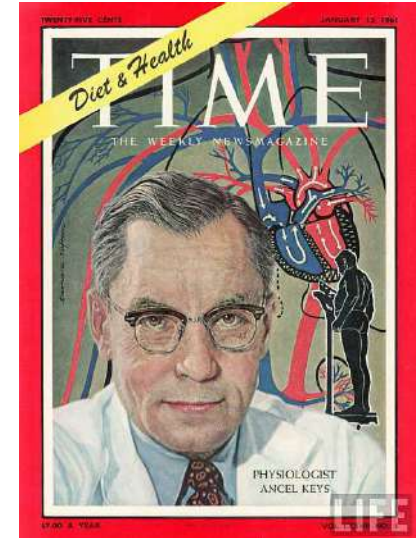
MEDITERRANEAN DIET



ALCOOL: 7 Kcal/1g

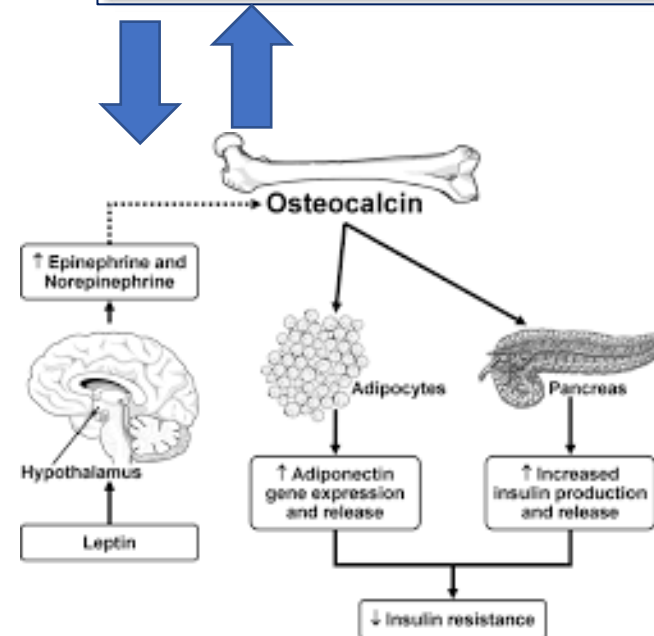
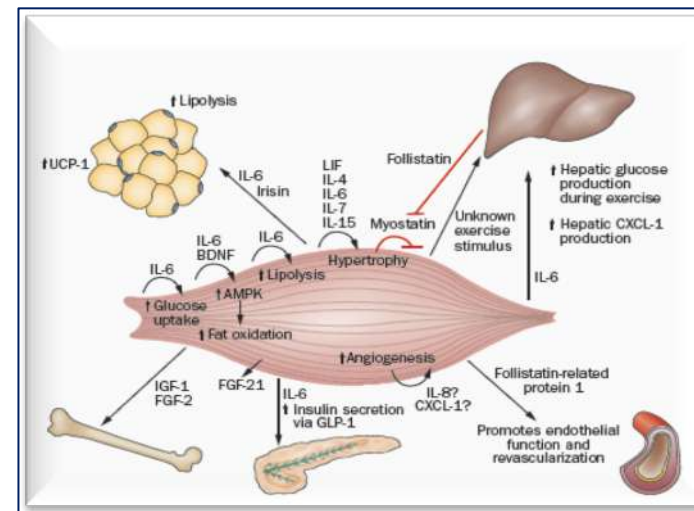
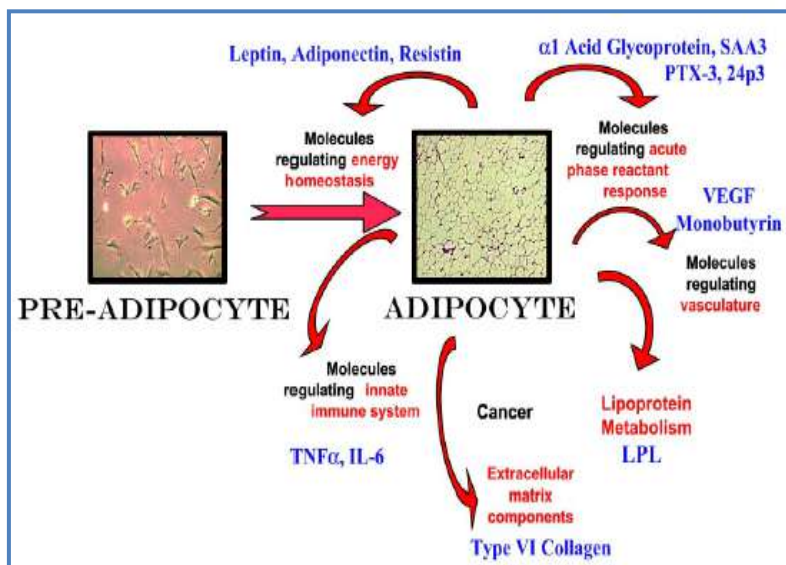
MEDITERRANEAN DIET (intangible cultural heritage in 2010)

- Fruit, vegetables, cereal (pasta, rice, couscous ...) wholemeal flours, potatoes, legumes, nuts, seeds
- Extra virgin olive oil as a condiment, limited use of foods of animal origin, instead better fish, poultry and eggs
- Moderate amount of wine
- Use of a single dish (as pasta and beans)



Mediterranean diet as nutritional approach for tissues health

Adipose Tissue
Skeletal Tissue
Muscle Tissue



RESEARCH

Open Access



Preliminary results demonstrating the impact of Mediterranean diet on bone health

Maria Cristina Savanelli¹, Luigi Barrea¹, Paolo Emidio Macchia^{2*}, Silvia Savastano², Andrea Falco¹, Andrea Renzullo², Elisabetta Scarano², Immacolata Cristina Nettore², Annamaria Colao² and Carolina Di Somma³

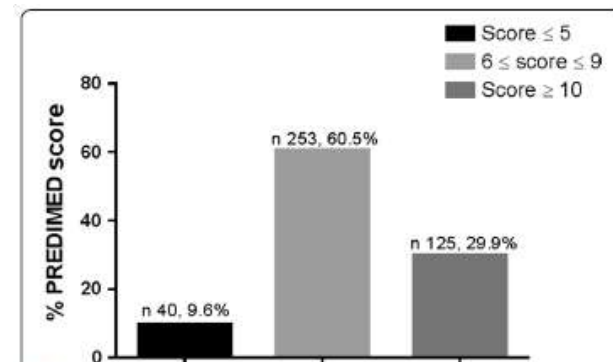


Fig. 1 Total PREDIMED score. Score 0–5, lowest adherence to the Mediterranean diet (MD); score 6–9, average adherence to the MD; score ≥ 10, highest adherence to the MD. PREDIMED, PREvencción con Dieta MEDiterránea

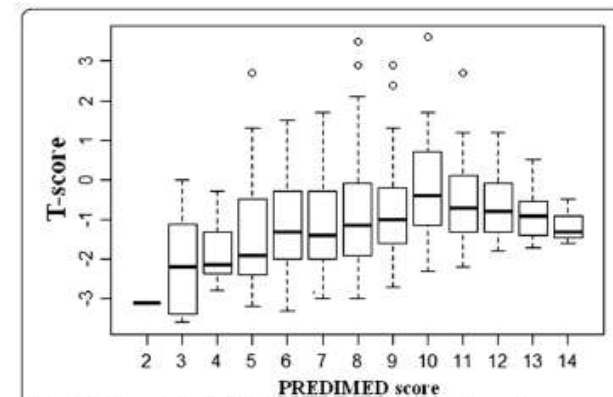


Fig. 2 Values of the PREDIMED score predicting the lower T-score. PREDIMED score 3 ($\alpha = 0.05$, R-squared index = 0.417) was found to be predictive for a lower T-score. The box plot regression shows how the categories under 8 include patients with a critical T-score (−2.5);

Conclusions: The results demonstrate a positive correlation between bone health status and adherence to MD, suggesting that a high adherence to MD promotes bone health. The observations here reported confirmed that a specific dietary approach, such as MD, can represent a modifiable environmental factor for osteoporosis' prevention.

Il microbiota intestinale: composizione e funzioni

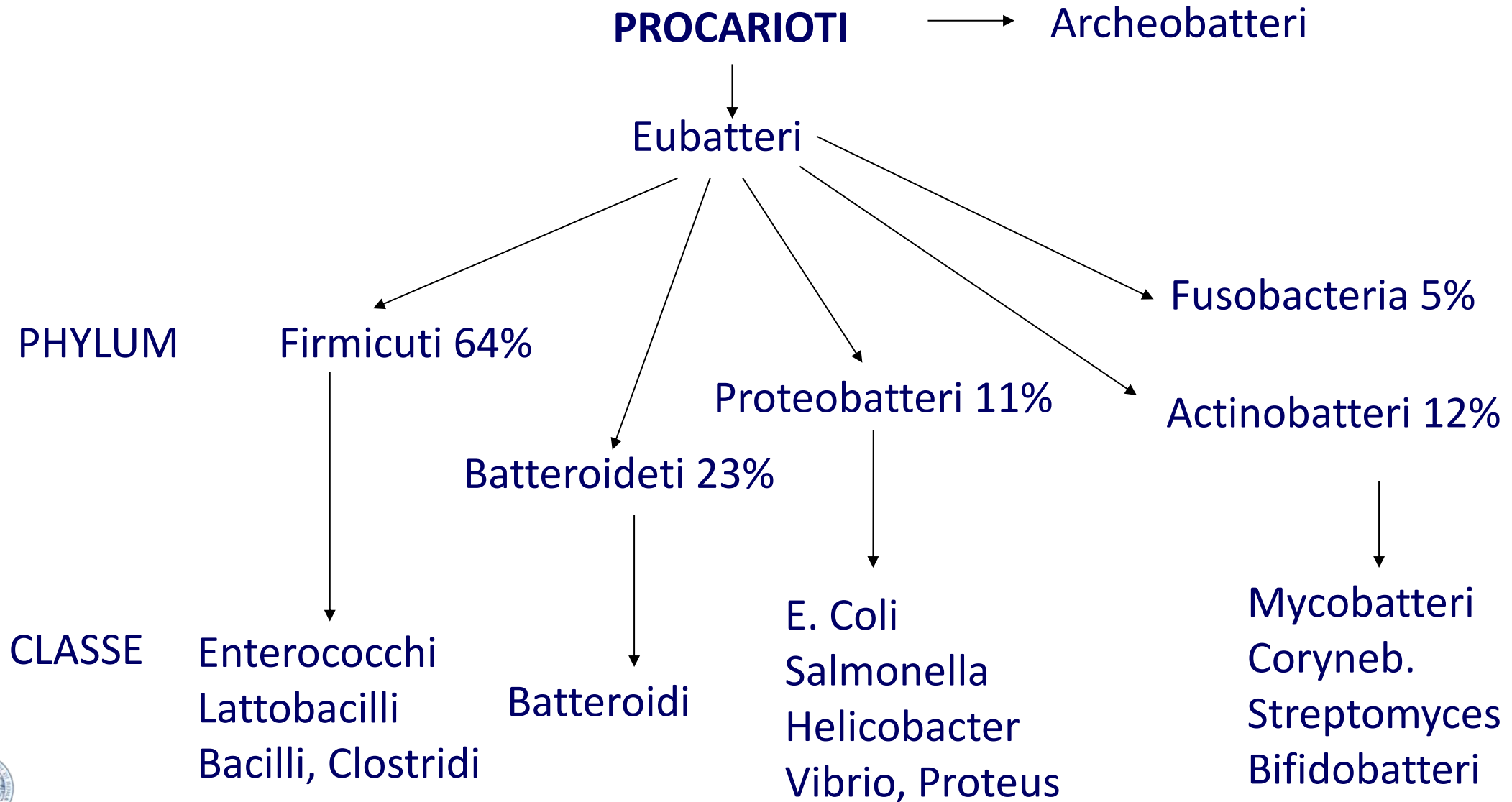
Il microbiota intestinale umano è un insieme di microrganismi che colonizzano l'intero tratto gastro intestinale, dal cavo orale, stomaco al colon. E' composto da più di 1.100 generi, circa 39 milioni di microbi in un rapporto 1:1 con le cellule eucariotiche



dell'organismo umano. Il ruolo del microbiota nel mantenimento dello stato di salute dipende dalle molteplici funzioni protettive, metaboliche e strutturali che esso stesso esercita.

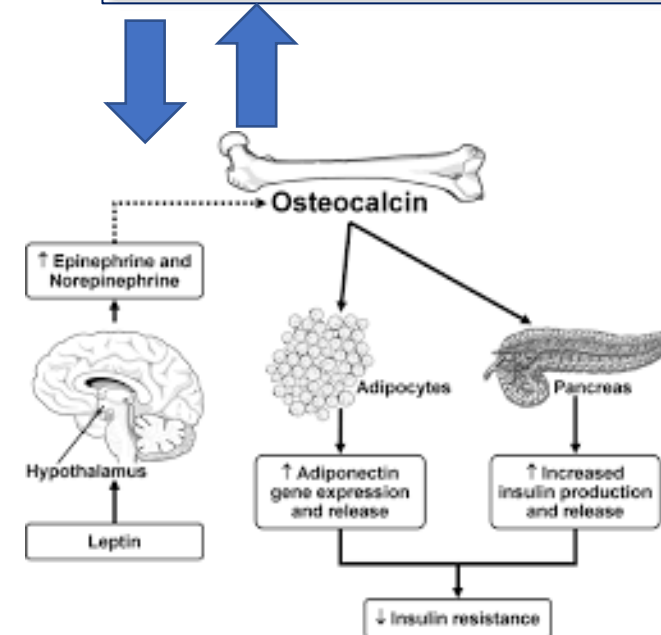
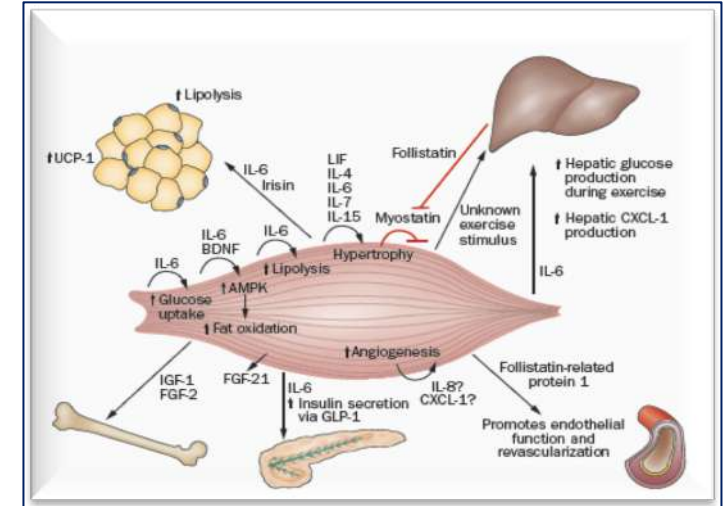
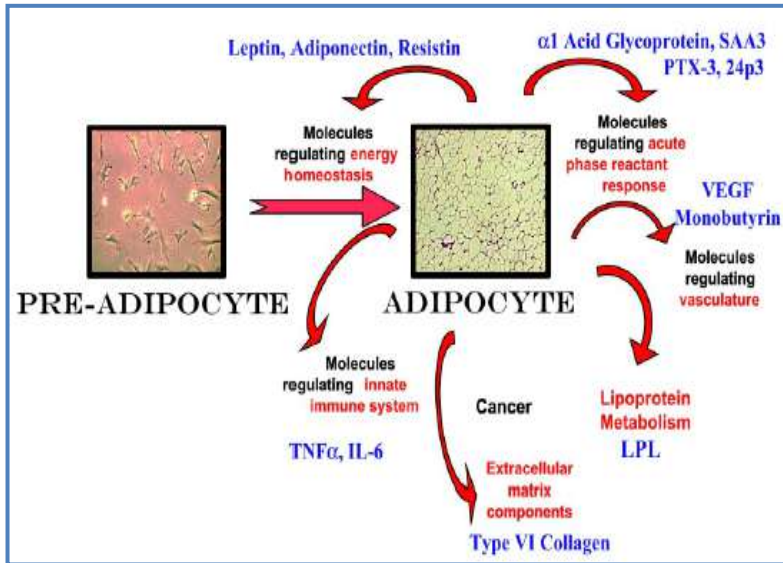
Esso infatti partecipa alle funzioni digestive, al mantenimento dell'integrità della barriera intestinale, contribuisce alla biosintesi e all'assorbimento di nutrienti, interagisce con il sistema immunitario, regola ed impedisce la colonizzazione delle mucose intestinali da parte di microrganismi patogeni, riveste un importante ruolo di metabolizzazione di farmaci e altre sostanze

Microbiota nell'intestino dell'adulto sano



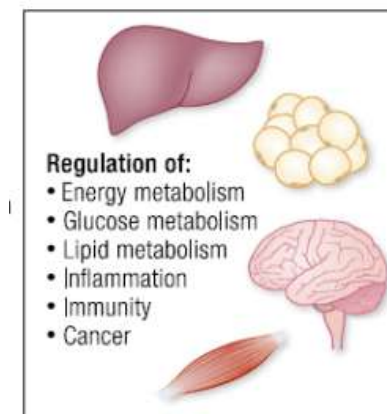
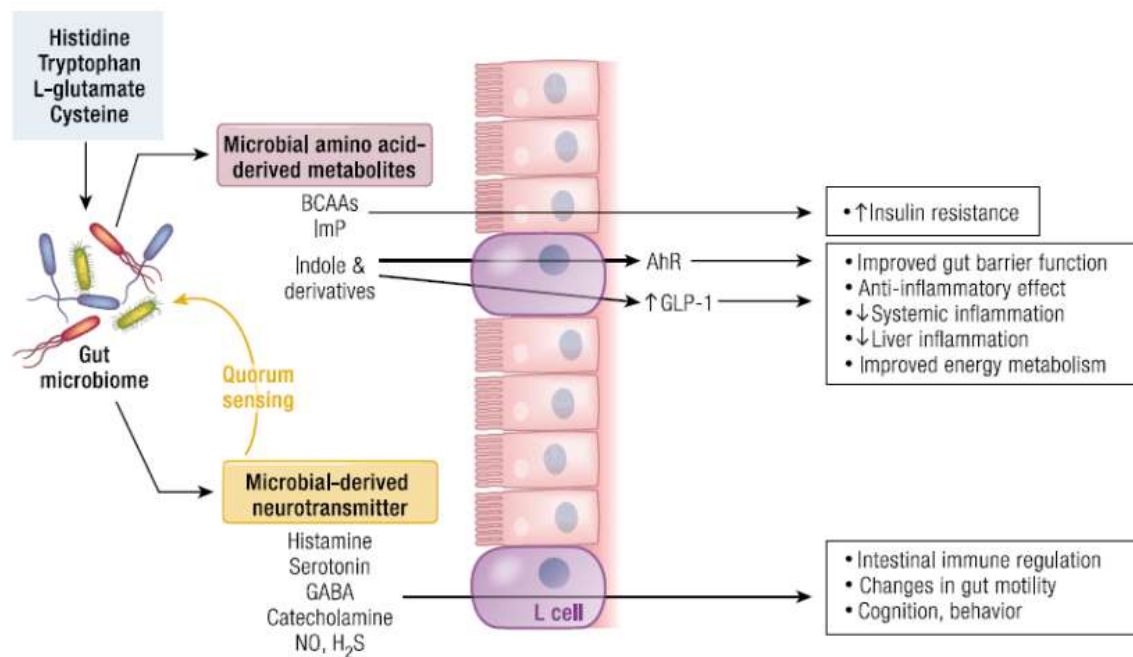
Nutritional Approach and Tissues Interactions

Adipose, Skeletal and Muscle Tissues and Microbioma



The Gut Microbiome Influences Host Endocrine Functions

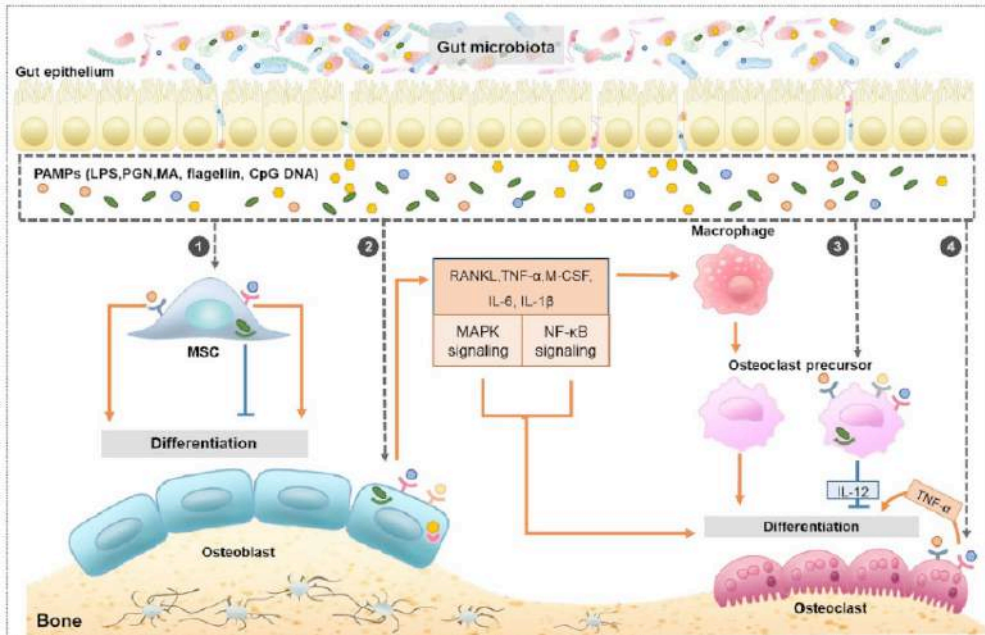
Marialetizia Rastelli,^{1,2} Patrice D. Cani,^{1,2} and Claude Knauf^{2,3}



REVIEWS

Gut microbiota and bone metabolism

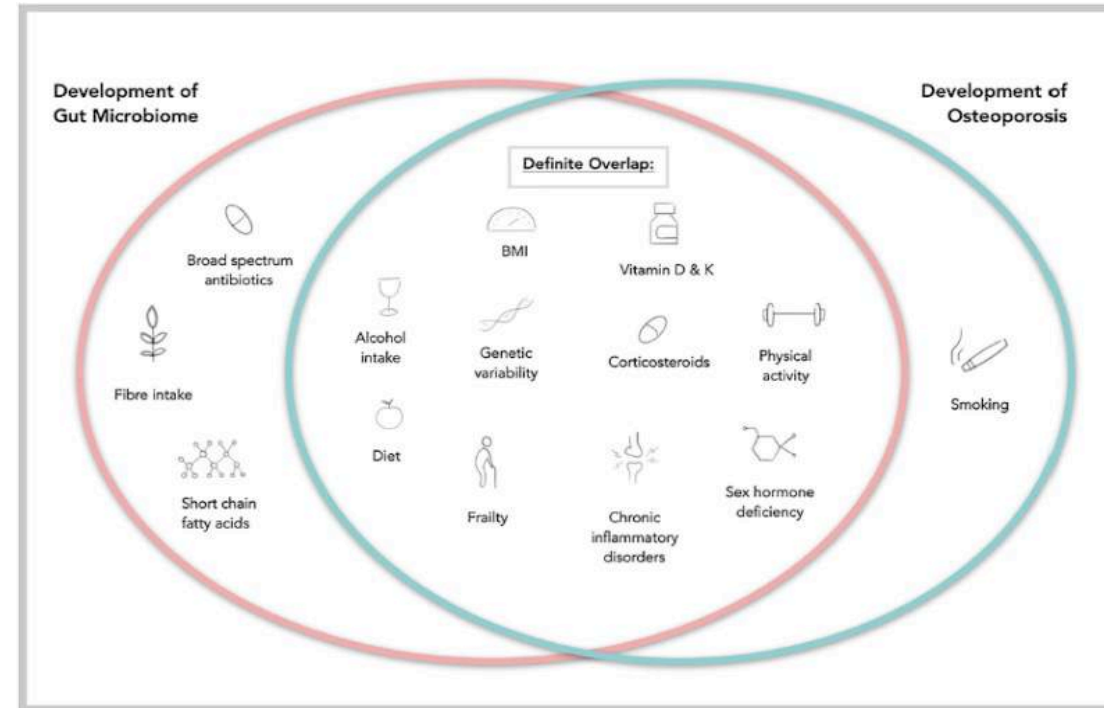
Lingyun Lu^{1,2}  | Xiaoxuan Chen³  | Yi Liu⁴  | Xijie Yu¹ 



REVIEW

Role of the Microbiome in Regulating Bone Metabolism and Susceptibility to Osteoporosis

Owen Cronin^{1,2} · Susan A. Lanham-New³ · Bernard M. Corfe⁴ · Celia L. Gregson^{5,6} · Andrea L. Darling³ · Kourosh R. Ahmadi³ · Philippa S. Gibson⁷ · Jon H. Tobias^{5,6} · Kate A. Ward^{8,9} · Maria H. Traka¹⁰ · Megan Rossi⁷ · Claire Williams¹¹ · Nicholas C. Harvey^{8,9} · Cyrus Cooper^{8,9,12} · Kevin Whelan⁷ · André G. Uitterlinden¹³ · Paul W. O’Toole¹⁴ · Claes Ohlsson¹⁵ · Juliet E. Compston¹⁶ · Stuart H. Ralston^{1,2} 

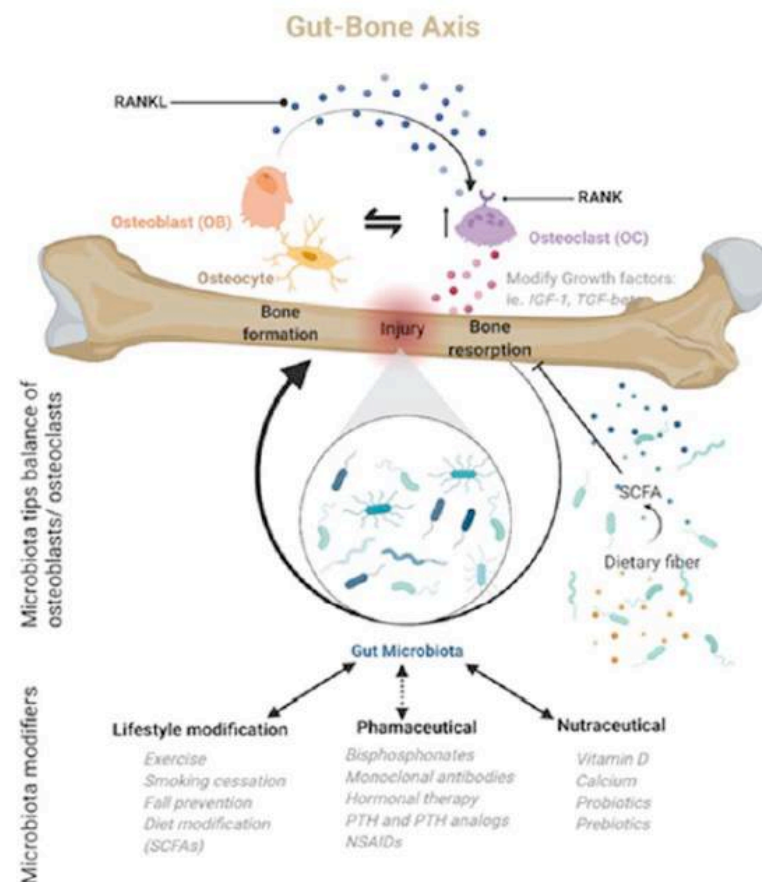
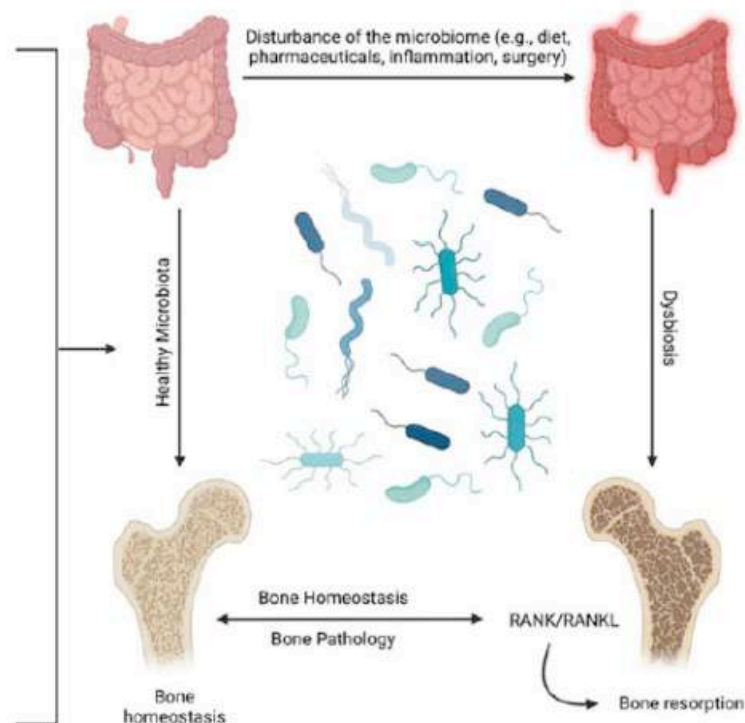


Review
The Human Gut Microbiota: A Key Mediator of Osteoporosis and Osteogenesis

Kevin D. Seely^{1,*}, Cody A. Kotelko¹, Hannah Douglas¹, Brandon Bealer¹ and Amanda E. Brooks^{1,2}


Mechanisms by which the microbiota impacts bone homeostasis

- Booster mineral absorption surface in the gut
- Restoring the gut epithelium barrier
- Modulate the immune response to microbiota
- Increase solubility of inorganic salts to improve their absorption across the gut wall
- Support osteoimmunity through microbiota metabolites
- Reducing oxidative stress
- Increase antimutagenic activity
- Degradation of mineral complexing phytic acid
- Proliferation of enterocytes and colonocytes
- Promote genetic changes in intestinal epithelial cells
- Modulation of growth factors and hormones
- Release of bone modulating factors
- Increase expression of calcium-binding proteins in the gut wall




Nutrition 114 (2023) 112118

Contents lists available at ScienceDirect



Nutrition

journal homepage: www.nutritionjrn.com



Review article

The role of the Mediterranean diet in modulating the gut microbiome: A review of current evidence

Aycan Gundogdu Ph.D. ^{a,b,*}, Ozkan Ufuk Nalbantoglu Ph.D. ^{b,c}





Table 1. Summary of the effects of dietary components of the MD on gut microbiota and associated health benefits.

Dietary Component of the MD	Dietary Origins within the MD	Effects on Gut Microbiota	Associated Health Benefits
Dietary fibres	Plant-based foods (vegetables, fruit, cereals)	Improved diversity; Increased <i>Bifidobacteria</i> and <i>Bacteroides</i> species, and SCFA-producing bacteria (<i>Clostridium leptum</i> and <i>Eubacterium rectale</i>)	Improved cardiometabolic health, insulin sensitivity and risk of developing colorectal carcinoma
Polyphenols	Extra virgin olive oil	Changes in lactic acid bacteria; Reduced <i>H. pylori</i>	Improved inflammatory, oxidative, endothelial and general metabolic health status; Prevention of gastric ulcer
PUFAs (including ω -3)	Oily fish Seafood Nuts	Reduced Firmicutes and <i>Blautia</i> species	Improved inflammatory and immune status; Improved intestinal epithelial barrier
Magnesium and Calcium	Fresh vegetables and fruit	Changes in caecal SCFAs; Favoured growth of lactobacilli; Regulation of intestinal tight junction gene expression	Improved gastrointestinal and psychiatric disorders; Improved growth performance
Selenium, Phytate, Zinc and Vitamin B6	Fresh vegetables and fruit	Regulation of intestinal brush border functionality and composition and diversity of gut microbiota	Possible impact on cardio-metabolic risk; Iron status
Relative lack of RCs, SFAs and TFAs	Lack of processed foods that typify a Western diet	Reduced propensity for diminishment of diversity and pro-inflammatory nature of gut microbiota	Reduced propensity for development of obesity, insulin resistance, endotoxaemia, leaky gut and metabolic dysfunction



Review

The Effects of the Mediterranean Diet on Health and Gut Microbiota

Thomas M. Barber^{1,2,3} , Stefan Kabisch^{4,5} , Andreas F. H. Pfeiffer^{4,5}  and Martin O. Weickert^{1,2,3,6,*} 

The Mediterranean diet (MedDiet) is recognized as one of the United Nations Educational, Scientific and Cultural Organization Intangible Cultural Heritage assets associated with lower rates of cardiometabolic diseases; lower prevalence of cancer, Alzheimer's disease, depression, and onset of inflammatory bowel disease; and more generally low-grade inflammation and mortality risks. Beyond being an input source of beneficial micronutrients, it recently has been discovered that the MedDiet plays a role in a more complex human microbiome-mediated mechanism. An interesting hypothesis suggests a bidirectional relationship between the MedDiet and the gut microbiome, where gut microbiota assembly and biosynthetic capacity are responsive to the diet; in return, the microbiome-reachable nutrients shape and modulate the microbiome toward a characteristic probiotic state. It can be speculated that that primary health benefits of the MedDiet exerted via the gut microbiome are mediated by the bioactive compounds transformed by the microbiome. Furthermore, it is possible that additional probiotic properties of the organisms promoted by diet adherence have secondary benefits. As more detailed omic-based studies take place, more evidence on the MedDiet as a core generic probiotic microbiome modulation strategy surface. However, individual-specific microbiome compositions might impose personal variations on the diet outcome. Therefore, a prospective strategy of a fine-tuned precision nutrition approach might deliver optimized benefits of the MedDiet.

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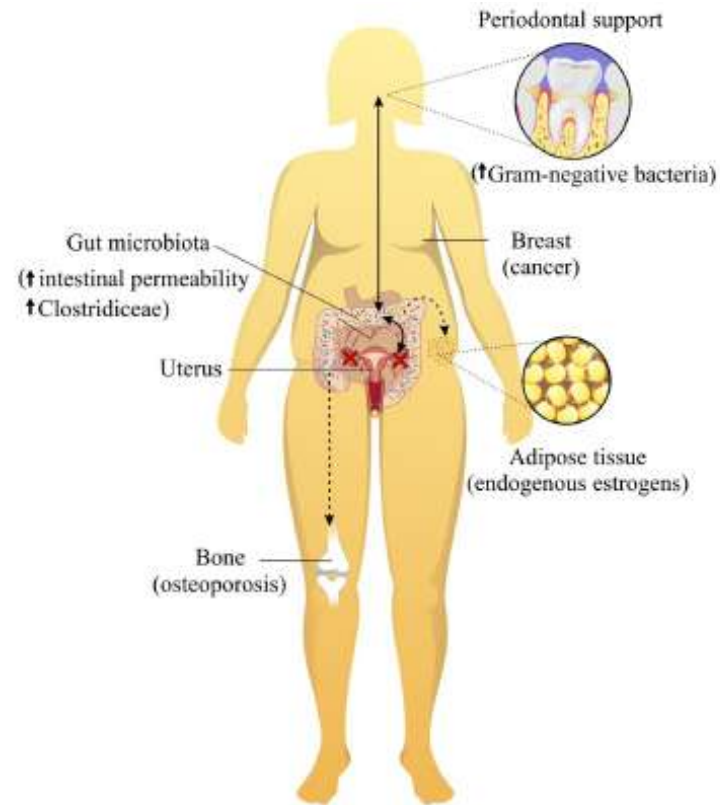
Mediterranean Diet and microbiota

- Effects of Med Diet exerted via the gut microbiome are mediated by the bio-active compounds transformed by the microbiome.
- Additional probiotic properties of the organisms promoted by the diet adherence brings secondary benefits. bioactive composition in the Med Diet takes place in phenolic excretion and increased the capacity of the gut microbiota to metabolize polyphenols in foods.
- Adherence to the diet results in higher levels of Faecali bacterium prausnitzii and certain clostridial species. Faecalibacterium clusters are able to biosynthesize butyrate likely mediating anti-inflammatory action (like akkermansia, also more represented in association with the diet)

Influence of Oral and Gut Microbiota in the Health of Menopausal Women

MINI REVIEW
published: 28 September 2017
doi: 10.3389/fmicb.2017.01884

Angélica T. Vieira¹, Paula M. Castelo^{2,3}, Daniel A. Ribeiro^{3,4} and Caroline M. Ferreira^{2,3*}



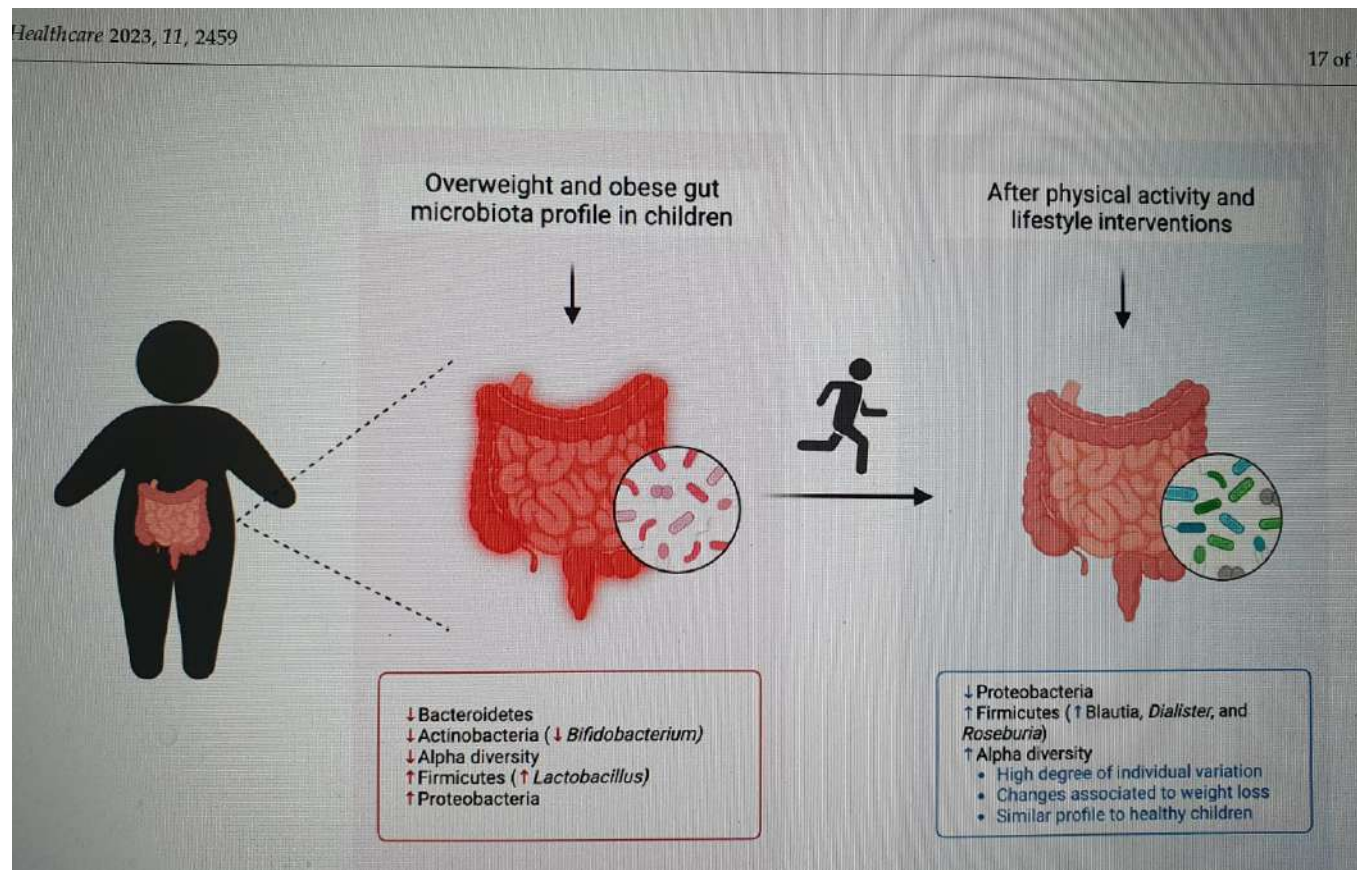
The accumulation of abdominal fat in postmenopausal women appears to be a critical factor in the development of insulin resistance and type 2 diabetes (Lobo et al., 2014), and the relationship between the gut microbiota and a lack of estrogen is likely responsible for weight gain and lipid deposition during menopause (Figure 1). The gut microbiota can metabolize estrogen-like compounds such as isoflavonoids, which are found in soy foods, and promote the growth of some specific bacteria (Frankenfeld et al., 2014; Chen and Madak-Erdogan, 2016; Miller et al., 2017). Indeed, the administration of soy isoflavones to postmenopausal women was shown to increase the concentration of *Bifidobacterium* and suppress Clostridiaceae, which are known to be involved in inflammatory diseases (Frankenfeld et al., 2014; Nakatsu et al., 2014). This suppression of Clostridiaceae, a family of Clostridia associated with obesity, likely explains why diets containing phytoestrogens have been shown to improve weight gain in menopausal women.

healthcare MDPI

Systematic Review

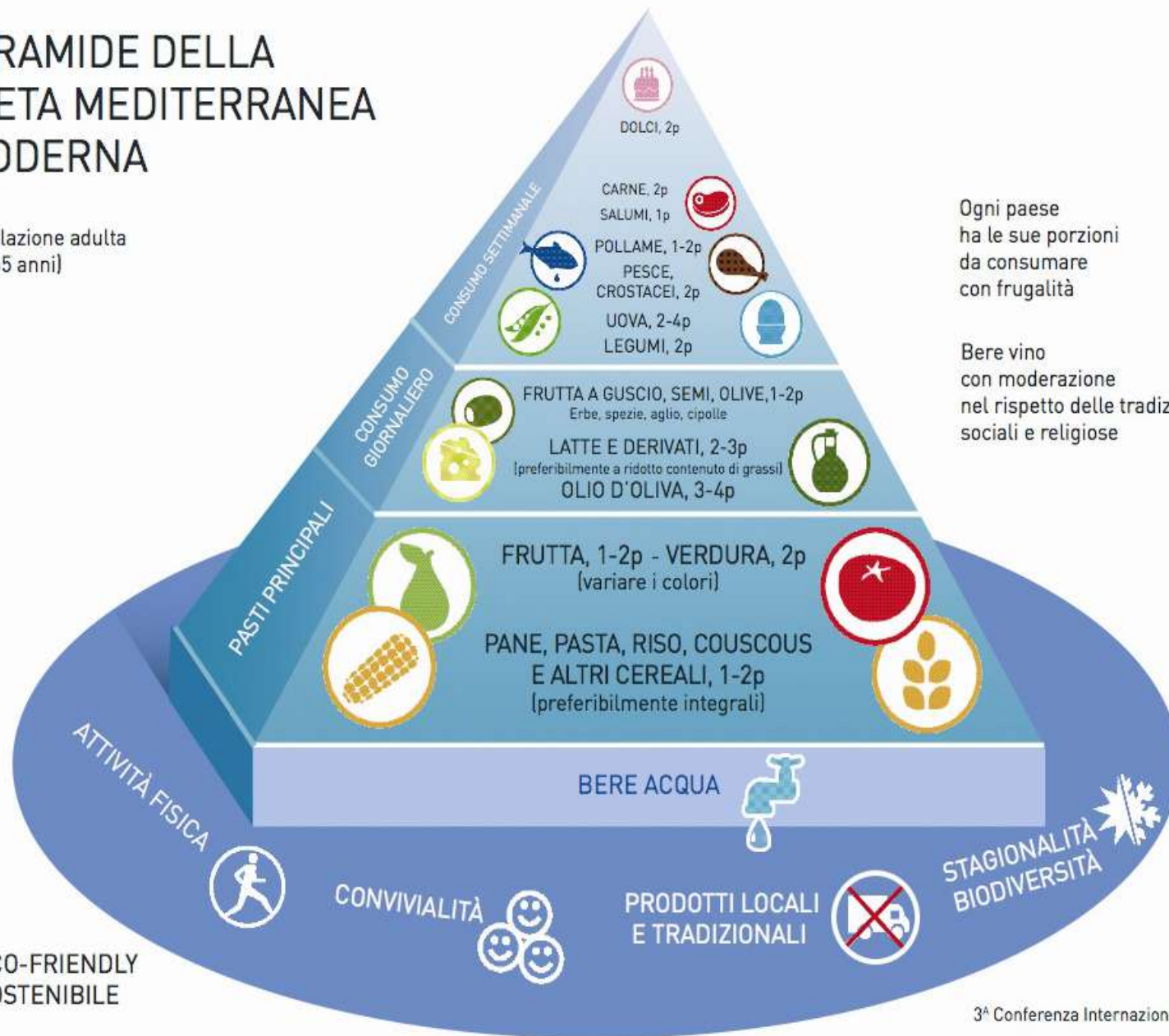
Exploring Gut Microbiota and the Influence of Physical Activity Interventions on Overweight and Obese Children and Adolescents: A Systematic Review

Micaela C. Morgado ^{1,2,*}, Mónica Sousa ^{3,4}, André B. Coelho ⁵, Júlio A. Costa ² and André Seabra ^{1,2}



PIRAMIDE DELLA DIETA MEDITERRANEA MODERNA

Popolazione adulta
(18-65 anni)



Ogni paese
ha le sue porzioni
da consumare
con frugalità

Bere vino
con moderazione
nel rispetto delle tradizioni
sociali e religiose

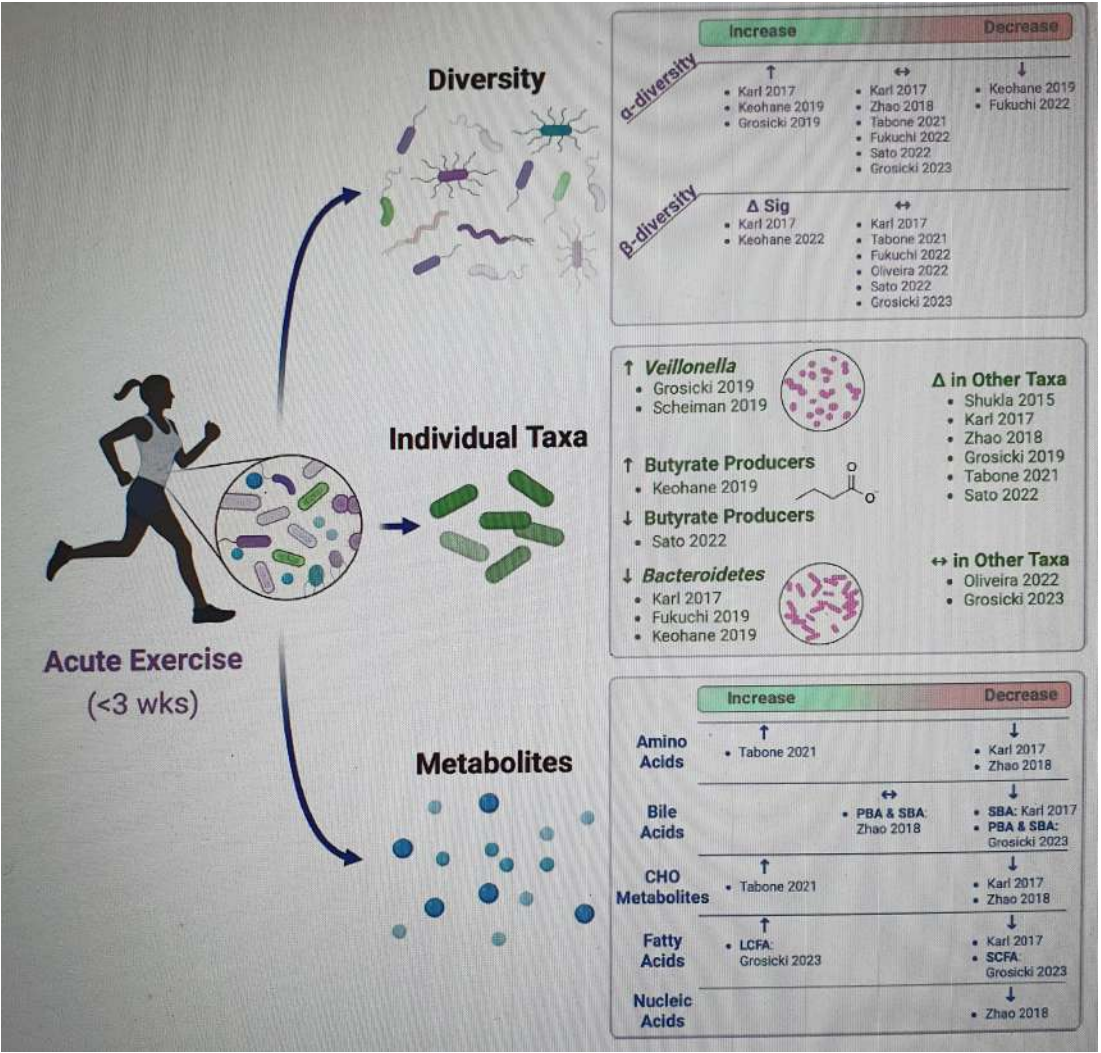
Received: 7 August 2023 | Accepted: 4 September 2023
 DOI: 10.1113/EP091446

REVIEW ARTICLE

EP Experimental Physiology WILEY


Gut check: Unveiling the influence of acute exercise on the gut microbiota

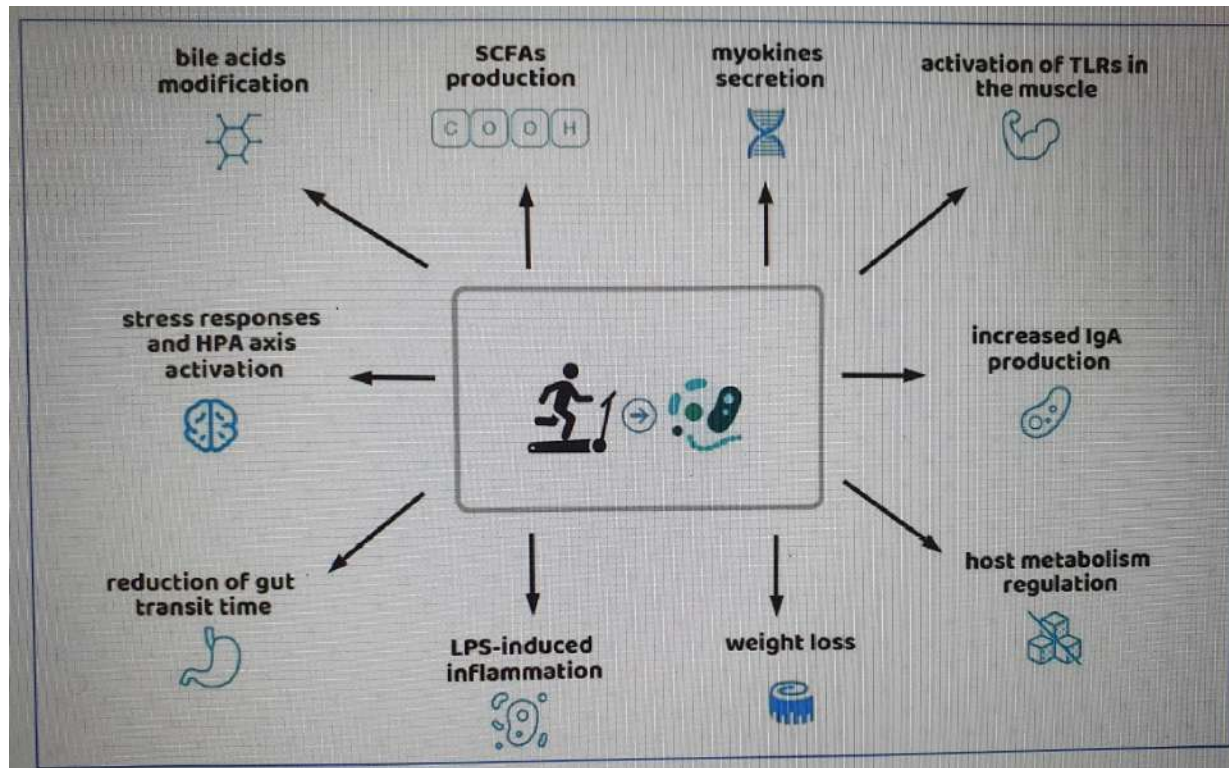
Gregory J. Grosicki¹ | Sean P. Langan² | James R. Bagley³ | Andrew J. Galpin⁴ | Dan Garner⁵ | Jarrad T. Hampton-Marcell⁶ | Jacob M. Allen⁷ | Austin T. Robinson⁸



Review

Nutrition and Physical Activity-Induced Changes in Gut Microbiota: Possible Implications for Human Health and Athletic Performance

Vittoria Cella ^{1,+}, Viviana M. Bimonte ^{1,+}, Claudia Sabato ^{2,+} , Antonio Paoli ³ , Carlo Baldari ⁴ , Matteo Campanella ⁴ , Andrea Lenzi ², Elisabetta Ferretti ²  and Silvia Migliaccio ^{1,*} 





Mediterranean Diet Skeleton and Microbiota



