

Nutrients
2019

Nutritional Advances in the Prevention and Management of Chronic Disease

BARCELONA | SPAIN | 25 - 27 SEPTEMBER 2019

Program and Abstract Book



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Nutrients 2019: Nutritional Advances in the Prevention and Management of Chronic Disease

AXA Convention Centre

Barcelona, Spain

25 – 27 September 2019

Conference Chairs

Prof. Lluís Serra Majem

Prof. María Luz Fernández

Organised by



Conference Secretariat

Sara Martínez

Pablo Velázquez

Facundo Santomé

Xiaocen Zhang

Lucia Russo



#Nutrients2019

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**Nutrients 2019 – Nutritional Advances in the
Prevention and Management of Chronic Disease
25 – 27 September 2019, Barcelona, Spain**

	Wednesday 25 September 2019	Thursday 26 September 2019	Friday 27 September 2019
Morning	Check-in Opening Ceremony	<i>Session 2</i>	<i>Session 5</i>
		<i>Special Session</i>	
		Coffee Break	Coffee Break
	<i>Session 1. Part I</i>	<i>Session 3</i>	<i>Session 6</i>
		<i>Session 7</i>	
	Lunch	Lunch & Poster Session A	Lunch & Poster Session B
	<i>Session 1. Part II</i>	<i>Session 4. Part I</i>	<i>Session 8</i>
Afternoon	Coffee Break	Coffee Break	Closing Remarks & Awards Ceremony
	<i>Session 1. Part III</i>	<i>Session 4. Part II</i>	Group Visit to Sant Pau Hospital-Art Nouveau Site
	<i>Selected Posters Flash Presentations</i>	Conference Dinner	

Wednesday 25 September 2019: 10:00 - 13:00 / 14:30 - 18:30

Thursday 26 September 2019: 09:00 - 13:30 / 15:00 - 18:30 / **Conference Dinner: 20:00**

Friday 27 September 2019: 09:00 - 13:00 / 14:30 - 16:30 / **Guided Visit to Sant Pau: 18:00**

Conference Programme

Wednesday 25 September 2019

- 09:00 Registration Desk Open (Check-in)
10:00 – 10:30 Opening Ceremony
Chairs: **Lluís Serra-Majem** and **María Luz Fernández**

Session 1. Part I **Nutritional Advances in the Prevention and Management of** **Chronic Disease**

Chair: **María Luz Fernández**

- 10:30 – 11:00 **Elizabeth Johnson** "The Role of Lutein in Cognitive Function through the Lifespan"
11:00 – 11:30 **Miguel Ángel Martínez-González** "Mediterranean Diet and Cardiometabolic Health in the PREDIMED Trials: the Extra Virgin Olive Oil"
11:30 – 11:45 **Andreas Nilsson** "Adherence to DASH-style Diets is Associated with Lower Inflammation in Older Women Independently of Physical Activity"
11:45 – 12:00 **Katarzyna Przybyłowicz** "The DASH Diet and Physical Activity and Their Association with the Risk of Poor Semen Quality: A Cross-Sectional Study"
12:00 – 12:15 **Carmen Pérez-Rodrigo** "Sociodemographic Factors Associated to Overweight in Spanish Children and Young People. ENPE Study"
12:15 – 12:30 **Marlene Escobedo Monge** "Zinc Nutritional Status in Children and Teenager Patients with Obesity"
12:30 – 12:45 **Noreen Willows** "Household Food Insecurity and Indigenous Identity in Relation to Chronic Disease and Mental Health Disorders in Canada"
12:45 – 13:00 **Lital Argaev-Frenkel** "N-acetyl Cysteine Treatment during Pregnancy and Lactation Improved Glucose Tolerance in HFD-fed Mice Offspring"

13:00 – 14:30 **Lunch**

Session 1. Part II
Nutritional Advances in the Prevention and Management of
Chronic Disease
Chair: **Jordi Salas**

- 14:30 – 15:00 **Martha Belury** "Targeting Peroxisome Proliferator-Activated Receptors with Dietary Oils to Prevent Diabetes"
- 15:00 – 15:15 **Layla Al-Nakkash** "Genistein and Exercise Prevent Body Weight Gain, Hyperglycemia, Hyperinsulinemia and Decrease Tau Phosphorylation Induced by High Fat/High Sucrose Diet"
- 15:15 – 15:30 **Janice Lim** "An Acute, Placebo-controlled, Crossover Study to Assess the Effects of New Zealand Pine Bark Extract on Glycaemic Responses in Healthy Participants"
- 15:30 – 15:45 **Luana Amorim Biondo** "Immunometabolic Effects of PPAR Gamma in Colorectal Carcinogenesis-induced Mice"
- 15:45 – 16:30 **Coffee Break**

Session 1. Part III
Nutritional Advances in the Prevention and Management of
Chronic Disease
Chair: **Alison Coates**

- 16:30 – 17:00 **Annemie Schols** "Nutrition in the Prevention and Management of COPD"
- 17:00 – 17:15 **Tovit Rosenzweig** "Sarcopoterium Spinosum Extract for the Prevention and Management of NAFLD"
- 17:15 – 17:30 **Janna L. Koole** "Longitudinal Associations between Serum Vitamin D Levels and Health-related Quality of Life in Colorectal Cancer Survivors Followed-up for 2 Years after Treatment"

- 17:30 – 17:45 **Julia Fedotova** “Synergic Effect of High Dose of Vitamin D3 and 17 β -estradiol in Long-term Ovariectomized Rats in Chronic Unpredictable Mild Stress: NF-kB and BDNF Implications”
- 17:45 – 18:00 **Yajun Xu** “Goat Milk Consumption Ameliorated Abnormalities in Glucose Metabolism and Enhanced Hepatic and Skeletal Muscle AMPK Activation in Rats Fed with High-fat Diets”

Selected Posters

3-min Flash Presentations

Chair: **Lluís Serra-Majem**

- 18:00 – 18:30 **Blackhall** (Poster No. 45); **Czlapka-Matyasik** (85); **Darewicz** (46); **Farràs** (90); **Gaffney** (55); **Nakamura** (69); **Parra-Vargas** (71); **Pellay** (78); **Ruiz-Iglesias** (83); **Yokoo** (75).

Thursday 26 September 2019

Session 2

Nutrients and the Microbiome

Chair: **Annemie Schols**

- 09:00 – 09:15 **Hwayoung Noh** “Gut Microbiota Composition and Diversity Associated with Dietary Intake in Korean Adults”
- 09:15 – 09:30 **Carles Lerin** “Diet Composition, Gut Microbiome, and Obesity in Children with Prader-Willi Syndrome”
- 09:30 – 09:45 **Adrián Cortés-Martín** “Drug Treatments Partially Determine the Effects of Pomegranate Consumption on the Gut Microbiota of Polymedicated Metabolic Syndrome Patients”
- 09:45 – 10:00 **Francisco Pérez-Cano** “Mother-offspring Transmission of Immunoglobulins and Microbiota through Breastmilk in Rats”

Special Session

Cognitive and Mental Health

Sponsored by the California Walnuts Commission

Chair: **Emilio Ros**

- 10:00 – 10:30 **Lenore Arab** “Nut Consumption Correlates with Women’s Cognition and Mood”

10:30 – 11:00 **Coffee Break**

10:30 – 10:40 **Conference Group Photograph**

Session 3

Bioactive/Functional Foods

Sponsored by the journal *Foods*

Chair: **Martha Belury**

- 11:00 – 11:30 **Alison Coates** “The Role of Nuts in the Prevention and Management of Chronic Diseases”
- 11:30 – 11:45 **Hassan Aboufarrag** “Effects of Anthocyanins Consumption on Markers of HDL function in Human”
- 11:45 – 12:00 **Levi Evans** “Emodin Inhibits Histone Deacetylase (HDAC) Activity and Pathological Cardiac Hypertrophy”

- 12:00 – 12:15 **Paula Aranaz** “Cocoa Extract Supplementation Improves High Fat Diet-induced Obesity, Hepatic Steatosis, Insulin Resistance and Glucose Intolerance in Wistar Rats”
- 12:15 – 12:30 **Guillermo Schmeda-Hirschmann** “Effect of the Roasting on the In Vitro Bioactivity, Phenolic, Oxylipins, and Fatty Acids of the Chilean Hazelnut (*Gevuina avellana* Mol., Proteaceae)”
- 12:30 – 12:45 **Pablo Hernández Alonso** “Circulating Metabolites Associated with Red Wine Consumption”
- 12:45 – 13:00 **Chun-Yu Chen** “A Dietary Polysaccharide from *Eucheuma cottonii* Modulates the Inflammatory Response and Suppresses Osteoarthritis-associated Cartilage Degradation in a Rat Model of Obesity”
- 13:00 – 13:15 **Paulus Jochems** “Pre-clinical Protein Screening in Bioengineered Intestinal Tubules”
- 13:15 – 13:30 **Brigkita Venardou** “High Pressure Extraction Conditions Influence the Antibacterial and Bifidogenic Properties of Bioactives from the Macroalgal Species *Laminaria hyperborea*”

13:30 – 15:00 **Lunch**

14:00 – 15:00 **Poster Session A**

Session 4. Part I Mediterranean Diet

Chair: **Lluís Serra-Majem**

- 15:00 – 15:30 **Jordi Salas Salvadó** “Role of Mediterranean Diet and Extra Virgin Olive Oil in the Prevention and Management of Obesity and Diabetes Mellitus”
- 15:30 – 16:00 **Emilio Ros** “Role of the Mediterranean Diet in the Prevention of Alzheimer Disease”
- 16:00 – 16:15 **Ricardo Losno** “Effects of a Mediterranean Diet Associated to a Program of Physical Activity and a Behavioral Support on the Biomarkers of Inflammation of Atheroma Plaque Stability in the Vascular Wall in People with High Cardiovascular Risk”
- 16:15– 16:30 **Rosa Casas** “The Effects of the Mediterranean Diet on Gene Expression Related with Cardiovascular Disease”

16:30 – 17:00 **Coffee Break**

Session 4. Part II
Mediterranean Diet
Chair: **Lluís Serra-Majem**

- 17:00 – 17:30 **María Luz Fernández** “Dietary Strategies to Reduce Metabolic Syndrome”
- 17:30 – 17:45 **Yasmine Aridi** “The Mediterranean Diet and Chronic Diseases- Results from a National-based Australian Study”
- 17:45 – 18:00 **Elena Yubero-Serrano** “Effect of Two Healthy Diets on Vascular Endothelial Homeostasis in Patients with Coronary Heart Disease”
- 18:00 – 18:15 **Barbara Zanini** “Lifestyle Modification in Patients with Non-Alcoholic Fatty Liver Disease: Results from an Italian Mediterranean Oriented Intervention Study”
- 18:15 – 18:30 **Susana Rey** “Red Wine as a Cardioprotective Agent: A Comparison between the Two Most Consumed D.O. Wines in Spain”

20:00 **Conference Dinner**

Friday 27 September 2019

Session 5

Nutrients and Lifestyle Interactions

Chair: **Joy Ngo**

- 09:00 – 09:15 **Blanca Riquelme Gallego** “Dietary Patterns and Nutritional Adequacy and Lifestyle Factors Among Medical Students of the University of Granada”
- 09:15 – 09:30 **Olivier Galy** “Food Consumption and Lifestyle in Melanesian Adolescents in the Global Transition of Pacific Countries”
- 09:30 – 09:45 **Lucía Iglesias Vázquez** “Determinants of Iron Status in Pregnant Women. ECLIPSES Study”
- 09:45 – 10:00 **Ayla Gülden Pekcan** “Determination of the Effect of Maternal Iodine Status on Newborns”

10:00 – 10:30 **Coffee Break**

Session 6

Nutrition for Ageing Populations

Chair: **Elizabeth Johnson**

- 10:30 – 11:00 **Rachel Wong** “Making Old Brains Young Again: the Benefits of Resveratrol on Cerebrovascular Function and Cognition”
- 11:00 – 11:15 **Fawzi Kadi** “The Favorable Impact of Dietary Fibre Intake on Body Composition in Older Adults is Independent of Physical Activity Habits”
- 11:15 – 11:30 **Catherine Féart** “Vitamins B6, Folates and B12 Intake and Risk for Frailty Among Community-dwellers from the Three-City-Bordeaux Cohort”

Session 7

Polyphenols and Antioxidants

Chair: **Rachel Wong**

- 11:30 – 11:45 **Sonemany Salinthon** “The Naturally Occurring Antioxidant Lipoic Acid Modulates Monocyte and Macrophage Function in Multiple Sclerosis”
- 11:45 – 12:00 **Mireia Obón-Santacana** “Dietary Inflammatory Index, Dietary Non-Enzymatic Antioxidant Capacity and Colorectal and Breast Cancer Risk (MCC-Spain Study)”

- 12:00 – 12:15 **Rabia Johnson** “Lanosteryl Triterpene from *Protorhus longifolia* Prevent Diabetes-induced Cardiomyopathy in H9c2 Cells”
- 12:15 – 12:30 **Serene Hilary** “Date Seeds as a Promising Future Functional Ingredient: Results from the In vitro Study of Bioaccessibility of Date Seed Polyphenols”
- 12:30 – 12:45 **Denise Beconcini** “Antioxidant and Anti-inflammatory Activity of Cherry Extract Encapsulated in Nanoparticles on Endothelial Cells”
- 12:45 – 13:00 **Katalina Muñoz-Durango** “Phenolic Compounds from Coffee Regulate Isoprostanes and Prostaglandins: an in vivo and in vitro Approach”

13:00 – 14:30 **Lunch**

13:30 – 14:30 **Poster Session B**

Session 8

Dietary Assessment

Chair: **Carmen Pérez Rodrigo**

- 14:30 – 14:45 **Silvia Marconi** “Development and Validation of a Self-administered Italian Semi-quantitative Food Frequency Questionnaire to Estimate Nutrient Intake”
- 14:45 – 15:00 **Carmen Ceballos-Juárez** “Dietary Patterns, Nutritional Components and Obesity Among Mexican Schoolchildren”
- 15:00 – 15:15 **Giulia Lorenzoni** “Association of Dietary Patterns with Heart Rate Variability: Results from a Cross Sectional Study”
- 15:15 – 15:30 **Alejandra Donaj Benítez** “Sodium Consumption in ‘Nova’ Dietary Patterns of Mexican Schoolchildren and Nutritional Status”
- 15:30 – 15:45 **Georgina Pujol-Busquets** “Exploring the Perceptions of Women from Under-resourced South African Communities about Participating in a Nutrition Education Program: A Qualitative Focus Group Study”
- 15:45– 16:00 **Marina Maintinguer Norde** “Inflammatory Dietary Patterns Derived by Reduced Rank Regression in Adults – Partial Results from a Systematic Review”

16:00 – 16:30 **Closing Remarks and Awards Ceremony**

Lluís Serra-Majem & Maria Luz Fernández

18:00 **Guided visit to Sant Pau** (Bus pick-up at 17:30)

NUT CONSUMPTION CORRELATES WITH WOMEN'S COGNITION AND MOOD



Thursday • September 26 • 2019

10:00 am - 10:30 am

Plenary Session at AXA CONVENTION CENTRE

PRESENTER

Dr. Lenore Arab

Nutritional Epidemiologist

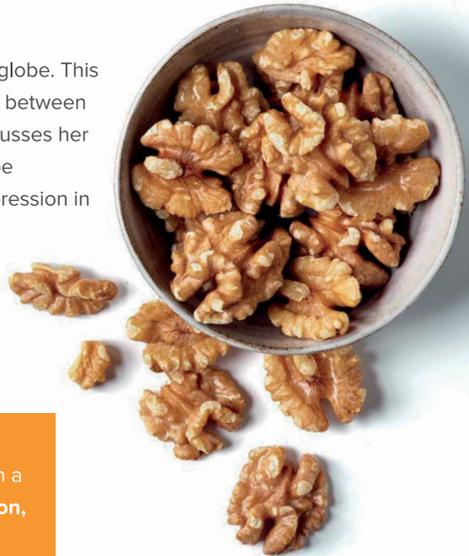
David Geffen School of Medicine at UCLA

Depression is a significant public health issue across the globe. This presentation provides evidence regarding the correlation between diet with cognitive status and mental health. Dr. Arab discusses her latest research suggesting that consuming walnuts may be associated with a lower prevalence and frequency of depression in various populations.

CALIFORNIA WALNUT COMMISSION (CWC) HEALTH RESEARCH PROGRAM

For more than 25 years, the CWC has supported health-related research to explore the role of walnuts in a healthy diet, focusing on the **body weight & composition, cancer, heart health, diabetes, cognitive health, reproductive health, metabolic syndrome and gut health.**

The CWC believes these scientific contributions are necessary for the development of dietary recommendations worldwide and establishing a strong scientific foundation aimed at improving public health. The CWC is committed to nutrition and health research and provides funds and/or walnuts for projects that have been peer-reviewed and which are conducted independently by researchers who design the experiments, interpret the results and present evidence-based conclusions.



Welcome by Lluís Serra Majem and María Luz Fernández

Dear Colleagues,

It is with great pleasure that we welcome you to the first international conference ***Nutrients 2019 - Nutritional Advances in the Prevention and Management of Chronic Disease***, a three-day event held in Barcelona, Spain, and organized by MDPI, the publisher of the open-access journal *Nutrients*.

Chronic diseases are increasing throughout the developed and developing world. A significant contributor to the burgeoning rates of chronic disease is diet, with some dietary components contributing to disease development, and others being protective. We hope this conference will turn into a forum where to discuss the impacts of diet on chronic disease.

The conference host ten internationally renowned speakers, who will share the program with another 50 inspiring oral communications selected from the numerous submissions received. The program will be complemented by poster sessions, including a special session where 10 posters selected for the Best Poster Award will be presented in a 3-min flash-format, and social events on the second and third day of the conference.

We hope that you all have a great experience and enjoy your stay in Barcelona!

Professor Lluís Serra Majem
Conference Chair



Editor-in-Chief of *Nutrients* and
President of the Spanish Academy
of Nutrition and Food Sciences.

Professor María Luz Fernández
Conference Chair



Editor-in-Chief of *Nutrients*.
University of Connecticut, USA.



nutrients

an Open Access Journal by MDPI

Nutrients (ISSN 2072-6643; CODEN: NUTRHU) is an international, peer-reviewed open access journal of human nutrition published monthly online by MDPI. *Nutrients* considers manuscripts for publication that provide novel insights into the impacts of nutrition on human health or novel methods for assessing nutritional status. This includes manuscripts describing the outcomes of animal studies that have relevance to human health.

Among other databases, *Nutrients* is indexed by the Science Citation Index Expanded (Web of Science), MEDLINE (PubMed), and Scopus.

Journal Webpage: <https://www.mdpi.com/journal/nutrients>

Impact factor: **4.171** (2018); 5-Year Impact Factor: 4.813 (2018)

MDPI, the Multidisciplinary Digital Publishing Institute, is an academic open access publisher, established in 1996. We publish over 200 peer-reviewed open access journals across ten different subject areas and offer publishing-related initiatives to scholars:

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- JAMS - A complete manuscript submission system that incorporates all steps from initial submission to publication, including peer-review.
- IOAP - We also offer an Institutional Open Access Program for universities and their libraries where affiliated authors benefit from discounts for publishing with our open access journals. Over 600 universities, societies and funders have joined MDPI's program since it was launched in 2013.

If you would like more information about open access or any of our services listed above, be sure to talk to us at the MDPI booth. See you there!



Nutrients 2019 – Nutritional Advances in the Prevention and Management of Chronic Disease will be held at the AXA Convention Centre, Barcelona, on 25 – 27 September 2019.

This conference seeks to gather together researchers, food industry representatives, policy makers, and others with an interest in the study of the impacts of diet on chronic disease.

Conference Venue

Auditorium AXA of the AXA Convention Centre
Avinguda Diagonal, 547, 08029 Barcelona, Spain

Registration Desk

The desk for registration, information and distribution of documents will be open from 09:00 on 25 September 2019.

Certificate of Attendance

Upon request, the participants of the event will receive an electronic Certificate of Attendance by email once the event is concluded.

Disclaimer

Delegates will receive a name-badge at the Information Desk, upon registration. The badge must be worn prominently in order to gain access to the congress area during all scientific and social events. Admission will be refused to anyone not in possession of an appropriate badge.

Insurance

The organizers do not accept liability for personal accident, loss, or damage to private property incurred as a result of participation in the *Nutrients 2019*. Delegates are advised to arrange appropriate insurance to cover travel, cancellation costs, medical, and theft or damage of belongings.

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Barcelona and Catalonia

Catalonia has become one of the favourite tourist destinations of Spain, mainly because of Barcelona, a city that never sleeps and knows how to please the big majority. With a history among the oldest in Europe, Barcelona offers a mixture of inland and seaside charms that panders the interests of everybody. The variety of artistic treasures, Romanesque churches and the works of famous artists such as Dalí, Gaudí, Miró or Picasso will make of your visit to the city a remarkable experience.



Parc Güell (Source: www.viajero-turismo.com)

Barcelona is the capital and largest city of Catalonia and Spain's second largest city, with a population of over one and half million people (over five million in the whole province). This city, bathed by the Mediterranean Sea, has become one of most cosmopolitan cities of Europe which has transformed it into the very modern, yet incredibly old city.

This beautiful city is full of what European cities are known for (outdoor markets, restaurants, shops, museums and churches) and which makes it the perfect scenario to get lost in its picturesque streets and avenues. Moreover, Barcelona's extensive and reliable Metro system will take you to more far-flung destinations. The core centre of the town, focused around the *Ciutat Vella* ("Old City"), provides days of enjoyment for those looking to experience the life of Barcelona while the beaches the city was built upon provide sun and relaxation during the long periods of agreeably warm weather. [Source: www.wikitavel.org].



Plaza España (Source: www.viajero-turismo.com)

The AXA Convention Centre

The event will be held at the Auditorium AXA of the AXA Convention Centre, which is part of an enormous complex located on the main artery of Barcelona that integrates a shopping centre, two hotels, 48.000 m² of offices, a parking lot, two schools, a sport centre and a public park. City communications are excellent and access from Barcelona's Airport and Sants Station is very quick.

The avant-garde design and construction quality emerge from each and every detail of the building, turning the l'ILLA complex into an emblematic reference of the city.

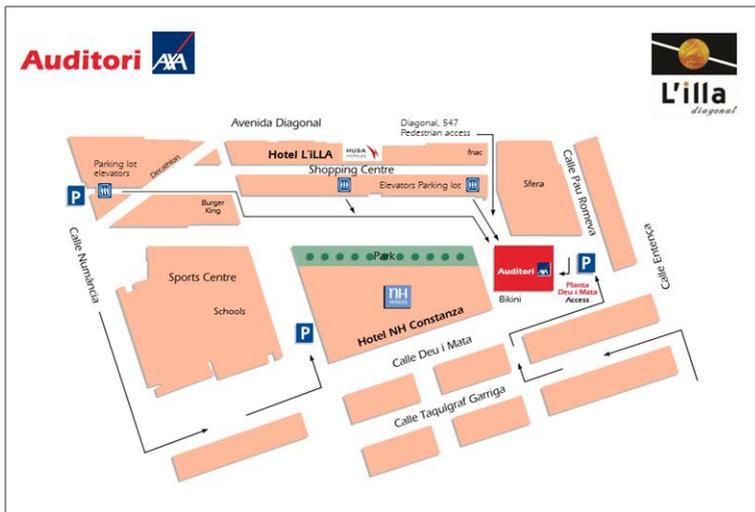


AXA Convention Centre (Source: www.axa.es)

As a whole, it is more than an auditorium: it is an infrastructure designed to offer quality, flexibility and integral attention through its wide range of services.

How to Reach the Venue

Address: Avinguda Diagonal, 547, 08029 Barcelona, Spain



Venue Location (Source: www.axa.es)

Social Events

Conference Dinner

Thursday 26 September, 20:00

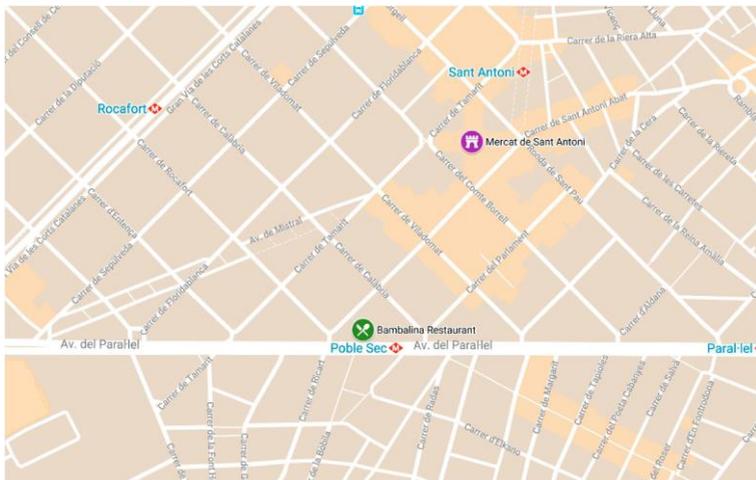
Price: 50€ Tickets must be purchased in advance, but you can ask for availability at the Information Desk.

The Conference Dinner will be held at **Bambalina**, a restaurant with a renewed Mediterranean-based set menu that preserves the essence of fresh seasonal products, all served in a space inspired by traditional taverns, but with a modern and fun ambiance, giving the place a comfortable and familiar atmosphere.

Bambalina is located in *Sant Antoni*, one of the trendiest neighborhoods in Barcelona, with a great variety of restaurants and vermouth bars. The most famous attraction in the area is the *Mercat de Sant Antoni*, an Art Nouveau building designed by Antoni Rovira i Trias and build in 1882, which has been recently reopened after almost a decade of renovations.

You can easily reach the restaurant either by taxi, bus or Metro. If you were to choose the latter, the closest metro station is "Poble Sec" on Line 3 (green).

Address: [Av. del Paral·lel, 142, 08015 Barcelona](#)



Group Visit to Sant Pau Hospital-Art Nouveau Site

Friday 27 September, 18:00 – 19:30

Price: 15€ *Tickets must be purchased in advance, but you can ask for availability at the Information Desk.*



Central Building and Garden (Source: www.santpaubarcelona.org)

The Modernista Sant Pau Complex was built between 1905 and 1930 and designed by *Lluís Domènech i Montaneras* a garden city for nursing the sick. After being used as a public hospital for a century, its newly refurbished pavilions shine again in all their splendour.

This is Europe's foremost art-nouveau complex and an icon among Barcelona's dazzling array of landmarks which embodies the city's innovative spirit. It was awarded World Heritage status by UNESCO in 1997.



Sant Pau's Pharmacy (Source: www.santpaubarcelona.org)

The exhibition space in the *Sant Salvador Pavilion* takes you on a journey through the history of medicine in Barcelona and one of Europe's oldest healthcare institutions. A visit to this magnificent complex allows you to delve into history,

art and the present day, making it a unique experience.

NOTE: The price includes transfer from the Venue to the Sant Pau Complex only.

Contact persons during the event



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Emergency Information

All emergencies in Spain: 112 (no area code needed)

Ambulance (Ambulancia) and health emergencies: 061 or 112

Fire brigade (Cuerpo de bomberos): 080 or 112

Spanish National Police (Policía nacional): 091

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Sciforum is an event planning platform that supports open science by offering the opportunity to host and participate in academic conferences. It provides an environment for scholarly exchange, discussion of topics of current interest, building of networks and establishing collaborations.

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Abstracts

Session 1. Nutritional Advances in the Prevention and
Management of Chronic Disease

The Role of Lutein in Cognitive Function through the Lifespan

Elizabeth Johnson

Friedman School of Nutrition Science and Policy, Tufts University, Boston, MA, USA

Lutein is a dietary carotenoid found in dark green, leafy vegetables, corn, eggs, and avocados. Epidemiological studies suggest that consumption of lutein-rich foods may be of benefit in promoting cognitive health. Among the carotenoids, lutein and its isomer, zeaxanthin, are the only two that cross the blood-retina barrier to form macular pigment (MP) in the retina. Lutein also preferentially accumulates in the human brain across multiple life stages. Lutein concentrations in the retina of human and nonhuman primates are significantly correlated with their levels in matched brain tissues allowing for the use of MP, which can be measured non-invasively in humans, as a biomarker of lutein in the brain. This has important implications for intervention studies involving foods and supplements containing lutein given that MP, like brain lutein, has been reported to be significantly related to cognitive function in adults. Intervention studies in adults indicate that lutein supplementation as well as food sources of lutein may positively affect cognitive performance and this effect may be influenced by the omega-3 fatty acid, docosahexaenoic acid. Although lutein is not an essential nutrient, efforts may be warranted to establish age-specific recommended intakes for this dietary bioactive for promotion of cognitive health.

Mediterranean Diet and Cardiometabolic Health in the PREDIMED Trials

Miguel A. Martínez González ¹, Alfredo Gea ^{1,2}, Miguel Ruiz Canela ³

¹ University of Navarra. IDISNA, Pamplona, Spain

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The Spanish PREDIMED trial, with 7447 participants was a landmark trial which assessed a 5-year intervention with a MedDiet. It showed that a Mediterranean diet supplemented with extra-virgin olive oil or mixed nuts relatively reduced in 30% the incidence of a composite major cardiovascular disease (CVD) end-point as compared to an intervention promoting a low-fat diet. This primary end-point included non-fatal stroke, non-fatal myocardial infarction and all fatal CVD events. PREDIMED remains to date as the largest dietary intervention trial assessing the effects of the Mediterranean diet. However, the results were retracted by the authors and simultaneously republished in 2018 in The New England Journal of Medicine, including many new analyses and comprehensively addressing potential criticisms and small departures from the protocol. A minimum proportion of participants were allocated to intervention by couples (5.7%) or by small clinics (6.2%). This issue was addressed by appropriate statistical approaches for potential clustering effects and also by removing these participants from the analyses. The results remained intact. PREDIMED also reported very strong reductions in peripheral artery disease and breast cancer (only when supplemented with extra-virgin olive oil). Moderate to high reductions in type 2 diabetes and atrial fibrillation were also associated with high consumption of extra-virgin olive oil. Funded by the European Research Council and the Spanish National Institute of Health Carlos III (ISCIII), we started, as vanguard center, the PREDIMED-Plus trial in 2013. PREDIMED-Plus is an on-going 6-year multicenter trial with 6874 participants assessing the cardiovascular effects of an energy-restricted Mediterranean diet with physical activity and weight loss. Both PREDIMED-1 (11 recruitment centers) and PREDIMEDPLUS (23 centers) started at the University of Navarra. The other centers learned from our experience. Final results will be available after 2022.

Reference:

Martínez-González, M.A.; Gea, A.; Ruiz-Canela, M. The Mediterranean Diet and Cardiovascular Health. *Circ. Res.* **2019**, *124*, 779–798.

Adherence to DASH-Style Diets Is Associated with Lower Inflammation in Older Women Independently of Physical Activity

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While dietary habits represent an important lifestyle factor in disease prevention, their effects on age-related chronic inflammation remain unclear. Even less is known about diet-related influences on inflammation when physical activity (PA) level is accounted for. Therefore, we examined links between dietary patterns and inflammatory biomarkers in a sample of older women, while accounting for adherence to PA guidelines. **METHODS:** A dietary construct based on the Dietary Approach to Stop Hypertension (DASH) was determined from food records in 112 community-dwelling older women (65–70 years old). Adherence to PA guidelines was assessed by accelerometry. The following serum inflammatory biomarkers were determined: adiponectin, interleukin-6 (IL-6), IL-10, IL-18, interleukin-10 receptor subunit alpha (IL-10R α), monocyte chemoattractant protein-1 (MCP-1), and macrophage inflammatory protein-1 alpha (MIP-1 α). Analysis of covariance (ANCOVA) was used to determine the influence on inflammatory outcomes across groups of adherence (low/high based on a tertile cut-point) to dietary patterns with adjustment for PA, waist circumference, and medication. **RESULTS:** Women belonging to the high adherence group had 20% and 14% higher ($p < 0.05$) levels of the anti-inflammatory biomarkers adiponectin and IL-10R α , respectively, and 5% and 2% lower ($p < 0.05$) levels of the pro-inflammatory biomarkers IL-18 and MCP-1, respectively, compared to the rest of the sample. These effects were independent of adherence to PA guidelines, while further adjustment for waist circumference attenuated effects on IL-18 ($p = 0.06$). Effects on other biomarkers were nonsignificant. **CONCLUSION:** Our findings highlight that DASH-style diets mitigate a pro-inflammatory milieu, mainly through an influence on specific anti-inflammatory biomarkers. Importantly, these favorable health impacts are independent of adherence to PA guidelines, which further emphasizes the promotion of healthy eating habits as a key strategy in lifestyle interventions designed to prevent age-related inflammation.

The DASH Diet and Physical Activity and Their Association with the Risk of Poor Semen Quality: A Cross-Sectional Study

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A healthy diet, as well as physical activity, may have a positive effect on human reproductive health, but this effect may be stronger if we put them concurrently in our daily life. The aim of the study was to examine the association between dietary approaches to stop hypertension (DASH) and physical activity (PA). This cross-sectional study was carried out in 207 men aged 18–55 years from Northern–Eastern Poland. Dietary data were obtained by a validated food frequency questionnaire (FFQ), and Günther’s DASH diet index with 10 components was calculated. PA and sedentary time were assessed using the validated International physical activity questionnaire (IPAQ)—long version. Semen samples were analyzed via computer-aided semen analysis (CASA). The association between DASH and PA and semen quality was evaluated using a generalized linear model. Mean age of participants was 21.7 years and their mean body mass index was 25.5 kg/m² (ranging 17.4–24.4 kg/m²). Strong adherence to the DASH diet was associated with a lower risk of abnormal total and progressive motility and morphology of semen. Higher PA was associated with a lower risk of abnormal total and progressive motility and total sperm count. However, when we analysed linked DASH and PA, the risk of abnormal parameters decreased for all semen characteristics. The results suggest that greater compliance with the DASH diet and higher PA may decrease the risk of poor semen quality. Following our novel findings, we may recommend using the DASH diet and PA concurrently, as a clinical and practical tool for improving or maintaining the semen quality.

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Sociodemographic Factors Associated to Overweight in Spanish Children and Young People. ENPE Study

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Background: The prevalence of overweight and obesity has increased gradually during the last few decades, although recent studies suggest stabilizing trends. The aim of this study was to analyze sociodemographic factors associated with the prevalence of overweight in Spanish people under 18 years of age. **Methods:** The data analyzed came from the ENPE study (Nutritional Study of the Spanish Population), a cross-sectional study conducted in a random population-based sample. Trained surveyors performed measurements of weight, height, and circumferences according to standardized protocols using approved materials. Overweight and obesity were defined according to IOTF criteria. As sociodemographic factors, age, sex, geographic region, size of the residence locality, educational level of the father and mother, and family socioeconomic level were considered. **Results:** Prevalence of overweight was estimated at 33.5% (95% CI 31.8–36.4) and obesity at 10.6% (95% CI 8.9–11.9); abdominal obesity was estimated at 31.2% (95% CI 29.0–33.5). The probability of overweight is greater in boys OR 1.88 (95% CI 1.50–2.36), in the group aged between 3 and 9 years OR 1.48 (1.07–2.04), and in low and mid-low socioeconomic environment OR 1.47 (95% CI 1.10–1.97). Prevalence of overweight is lower in the east and northeast region OR 0.61 (95% CI 0.45–0.83). **Conclusions:** The prevalence of overweight and obesity in Spanish children and young people is high, higher in boys, in children under 10, and in low and mid-low socioeconomic levels.

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Zinc Nutritional Status in Children and Teenager Patients with Obesity

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Background: Zinc is an essential nutrient, and its deficiency affects the normal growth and development of human beings. Objective: The main aim was to investigate zinc nutritional status by serum zinc concentration (SZC) and dietary zinc intake and their association in obesity patients. **Methods:** A cross-sectional study was conducted in 22 patients (9 males). Anthropometric measurements and blood analysis were conducted. Hypozincemia was determined by SZC while using atomic absorption spectrophotometry and dietary zinc deficiency (DZD) through prospective 72-h dietary surveys. **Results:** Mean SZC ($85.9 \pm 10.9 \mu\text{g/dL}$) was normal, but dietary zinc intake ($74.8 \pm 27\%$ dietary reference intake) was low. Two of 22 obesity patients (9%) had hypozincemia and thirteen (59%) had a DZD. Two teenagers with DZD had hypozincemia. A positive and significant association was observed between SZC and serum iron ($r = 0.49$, $p = 0.023$), magnesium ($r = 0.58$, $p = 0.006$), glucose ($r = 0.52$, $p = 0.015$) and haemoglobin ($r = 0.55$, $p = 0.008$). There was also a positive association between dietary zinc and protein ($r = 0.47$, $p = 0.029$) and magnesium intake ($r = 0.52$, $p = 0.013$), and negative association with niacin ($r = -0.47$, $p = 0.026$) and serum phosphorus ($r = -0.63$, $p = 0.002$). **Conclusion:** SZC was associated with the nutritional status, expressed as serum iron, magnesium, glucose and haemoglobin, and dietary zinc intake with total protein intake, niacin and magnesium consumption, and serum phosphorus. Only two patients with hypozincemia had DZD. This situation should alert us to a marginal zinc deficiency, and it may explain why there were no more overlapping cases between the two groups. We suggest that probably 50% of the cases in this study would be at elevated risk of zinc deficiency, and a zinc supplementation may be considered.

Household Food Insecurity and Indigenous Identity in Relation to Chronic Disease and Mental Health Disorders in Canada

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Background: Indigenous Peoples (IP) globally often have poor health. IP in Canada have more household food insecurity, chronic disease, and mental health disorders than non-Indigenous (NI) Canadians. The objective was to investigate if food insecurity contributes to the additional disease burden that IP in Canada experience. **Methods:** The associations of Indigenous identity and food insecurity to chronic disease and mental health disorders were examined using data from the 2015/2016 Canadian Community Health Survey. Participants in 59,082 households responded to the validated Household Food Security Survey Module and self-reported chronic diseases (e.g., osteoporosis) and mental health disorders (e.g., depression). IP on-reserves and persons living in health care institutions, remote areas, and members of the Canadian Forces were excluded from the survey. Households where respondents had any worry about running out of food were considered food-insecure (FI). Associations were determined by multivariable logistic regression, with sociodemographic confounders accounted for. Results were weighted to represent the Canadian population. **Results:** Six per cent ($n = 3756$) of respondents were IP, with 26.3% of them living in an FI household. Among NI respondents, 9.7% lived in FI households. Compared to the food-secure (FS) NI, FI NI, FS IP, and FI IP were 1.63 (95%CI: 1.45, 1.85), 1.45 (95%CI: 1.22, 1.74), and 2.35 times (95%CI: 1.78, 3.10) more likely to have a chronic disease, respectively. For mental health disorders, the likelihood was 2.60 (95%CI: 2.33, 2.92), 1.68 (95%CI: 1.38, 2.05), and 3.55 times (95%CI: 2.79, 4.51) higher for FI NI, FS IP, and FI IP, respectively. **Conclusions:** Indigenous respondents were three times more likely to be food-insecure than non-Indigenous respondents, with insecurity associated with higher prevalence of chronic disease and mental health disorders. Health policy decisions should focus on food security initiatives for all Canadians, with additional attention to programs for Indigenous households.

***N*-acetyl Cysteine Treatment during Pregnancy and Lactation Improved Glucose Tolerance in HFD-Fed Mice Offspring**

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Exposure to certain environmental factors during the early stages of development was found to affect health in adulthood. Among other environmental factors, oxidative stress has been suggested to be involved in fetal programming, leading to elevated risk for metabolic disorders, including type 2 diabetes; however, the possibility that antioxidant consumption during early life may affect the development of diabetes has scarcely been studied. The aim of this study was to investigate the effects of *N*-acetyl-L-cysteine (NAC) given during pregnancy and lactation on the susceptibility of offspring to develop glucose intolerance and type 2 diabetes induced by high fat diet (HFD) feeding at adulthood. C57bl6 mice were given NAC during pregnancy and lactation. Isolated islets of NAC-treated offspring (6 weeks old) had an increased efficacy of glucose-stimulated insulin secretion (GSIS) and a higher resistance to H₂O₂-induced damage. HFD was given to offspring at an age of 6 weeks for an additional 9 weeks. Results of glucose and insulin tolerance tests were improved, fasting insulin level was reduced, and islet diameter was lower in male offspring of NAC-treated mice compared to their HFD-fed littermates. Insulin sensitivity in skeletal muscle was increased, as determined by elevated phosphorylation of Akt, GSK3 β , and PRAS40 in offspring of NAC-treated mice. **Conclusion:** NAC consumption during early life improves glucose tolerance in adulthood in male, but not female mice. The epigenetic mechanisms underlying the observed effects should be investigated further.

Targeting Peroxisome Proliferator-Activated Receptors with Dietary Oils to Prevent Diabetes

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Complications from uncontrolled hyperglycemia lead to high rates of morbidity and mortality in people with type 2 diabetes mellitus (T2DM). Thiazolidinedione (TZD) drugs improve insulin sensitivity but can have adverse side effects making lifestyle factors an attractive complementary or alternative therapy. Other than weight loss, mechanistically targeted dietary approaches to improve insulin sensitivity are lacking. The type of dietary fats that people consume impact insulin sensitivity. In two previous clinical trials, we found that supplementing the diet with a modest amount of linoleic acid-rich oil (LA, 18:2n6) in 1-2/3 teasp LA-rich oil/day improved glycemia and body composition and increased blood levels of adiponectin in women with T2DM or metabolic syndrome. Our studies corroborate numerous epidemiological studies showing that higher levels of LA in the diet or blood are related to better insulin sensitivity and reduced risk for T2DM. Non-obese mice fed a diet enriched with LA-oil have increased levels of LA and LA-derived oxylipins, 9-hydroxyoctadecadienoate (9-HODE) and 13-HODE in skeletal muscle. Furthermore, women supplemented with LA-oil have significantly higher levels of plasma 9-HODE and 13-HODE as well as higher adiponectin levels after 16 weeks. Finally, women with higher blood levels of LA, even when not supplemented, have higher lean mass and better insulin sensitivity. 9-HODE and 13-HODE, previously found to be high-affinity ligands for the PPARgamma, may be a useful approach to attenuate dysregulated metabolism and body composition associated with the metabolic syndrome and T2DM.

Genistein and Exercise Prevent Body Weight Gain, Hyperglycemia, Hyperinsulinemia, and Decrease Tau Phosphorylation Induced by High Fat/High Sucrose Diet

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Background: Consumption of a high fat/high sugar (HFHS) diet has been identified as risk factor for obesity, type 2 diabetes mellitus, and for development of neurodegenerative diseases like Alzheimer's (AD). Genistein, a naturally occurring isoflavone found in soy, improves insulin sensitivity and has neuroprotective properties. Similar benefits have also been associated with moderate exercise. The aim of this study was to determine whether dietary genistein (600 mg genistein/kg diet, Gen) or moderate exercise (Ex) or both (Gen+Ex) would reduce the obese–diabetic phenotype and limit progression of AD in C57BL/6J male and female mice. **Methods:** C57BL/6J mice (5–6 weeks old) were randomly assigned to one of the following groups ($n = 10/\text{group}$): lean control, HFHS, HFHS+Gen, HFHS+Ex, and HFHS+Gen+Ex. The HFD consisted of 60% saturated fat. Drinking water contained sucrose and fructose. Moderate exercise comprised daily treadmill running for 150 minutes/week for the 12-week study. **Results:** In males, body weight was reduced 12–18% in Ex or Gen and reduced 42% ($P < 0.05$) by Gen-Ex compared to HFHS. In females, body weight was decreased 8% with Gen ($P < 0.05$), and reduced 16% by Gen+Ex ($P < 0.05$). Our results demonstrate that serum glucose and insulin levels in females and males were rescued by Gen+Ex compared to controls. Claudin-1 mRNA levels were improved 50% by Gen+Ex, indicating benefits on intestinal epithelial barrier function, in the absence of benefits to intestinal Cl secretion. Western blot evaluation determined that Gen+Ex reduced CP13 expression ($P < 0.05$), a kinase mediating tau phosphorylation in males. **Conclusions:** Genistein and exercise have sex-dependent effects on HFHS-fed mice: (1) A greater weight loss in males with Gen+Ex compared to females. (2) Gen reduced CP13 expression, suggestive of Gen's ability to reduce tau phosphorylation in males. We aim to determine mechanistic pathways for these sex-dependent effects and will correlate genistein- and exercise-mediated improvements in diabetic-obesity to markers for AD.

An Acute, Placebo-Controlled, Crossover Study to Assess the Effects of New Zealand Pine Bark Extract on Glycaemic Responses in Healthy Participants

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Introduction: An estimated 425 million people worldwide have diabetes, and numbers are expected to increase to 629 million by 2045. Various natural plant extracts have shown promise in improving glycaemic control in humans. To date, no studies have investigated the impact of New Zealand (NZ) pine bark obtained from *Pinus radiata* trees on blood glucose response. **Materials and methods:** This was an acute, placebo-controlled, crossover study investigating the impact of 50 and 400 mg of pine bark on healthy participants. Capillary blood samples were taken at -20, 0, 15, 30, 45, 60, 90, and 120 minutes during a 2-hour oral glucose tolerance test (OGTT). Incremental area under the curve (iAUC) of postprandial glucose was calculated (trapezoidal rule). Participants were also classified into either exhibiting a monophasic glucose curve shape (M) (higher risk for type 2 diabetes mellitus) or complex glucose curve shape (bi- or triphasic) (BT) at baseline. Statistical analysis was carried out using one-way factorial repeated-measures ANOVA (95% confidence interval) with Bonferroni post-hoc analyses. **Results and discussion:** Twenty-five healthy participants (15 women and 10 men, 24.8 ± 0.8 years) completed the study (both control and 50 mg dose), with twenty of them also completing a 400 mg dose. The mean iAUC in the M glucose shape group was significantly lower in the 50 mg dose than the control (M:12, BT:13), $p = 0.034$ (iAUC of 241.3 ± 20.2 vs. 335.4 ± 34.0 mmol/L.min, respectively, 28.1% reduction) and also significantly lower in 400 mg than control (M:11, BT:9), $p = 0.012$ (iAUC of 249.3 ± 25.4 vs. 353.6 ± 31.5 mmol/L.min, respectively, 29.5% reduction). No significant difference was detected in mean iAUC in the BT glucose shape group between control and 50 and 400 mg doses, $p > 0.05$. **Conclusions:** Results from the present study suggest that NZ pine bark may have glucose-lowering effects in healthy, normoglycaemic participants exhibiting monophasic glucose shapes and therefore may have the potential to reduce future type 2 diabetes mellitus risk in these individuals.

Immunometabolic Effects of PPAR Gamma in Colorectal Carcinogenesis-Induced Mice

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Introduction: Although obesity is currently a risk factor for cancer, the intake of high fat diet (HFD) associated to the carcinogenesis model decreased mortality, induced recovery of body weight, and reduced the size of tumor. PPAR γ is a nuclear factor that is highly expressed in adipocytes and macrophages; furthermore, PPAR γ agonists increased survival and quality of life. However, metabolic and endocrine functions controlled by PPAR γ can be impaired, such as anti-inflammatory response, mainly in macrophages.

Objective: To investigate the role of PPAR γ in colon carcinogenesis of mice with ablation of PPAR γ in cells expressing lysozyme, focusing in macrophages and adipose tissue analysis. **Methods:** PPAR γ CreLox mice with deletion in myeloid (KO) cells and control animals (WT) were divided into 3 groups: high fat diet (HFD); HFD and induction of colorectal carcinogenesis; HFD, colorectal carcinogenesis, and PPAR γ agonist (pioglitazone). Parameters evaluated: delta weight gain and adipose depots weight; leptin and adiponectin in serum; in adipose tissue: glucose uptake; M1 and M2 phenotyping using flow cytometer; IL-6, IL-10, IL-1 β , and PPAR γ gene expression. **Results:** Cancer reduced delta weight gain and reduced adipose depots mainly in mesenteric and retroperitoneal in WT. HFD diet worsened glucose uptake and PPAR γ agonist improved glucose uptake in WT and KO. Pioglitazone also increased circulating adiponectin and reduced free fatty acids in KO and WT animals. The percentages of macrophages M1 and M2 were similar but a lower percentage of nonresident macrophages in KO animals and pioglitazone was efficient in recovering these nonresident macrophages. Low gene expression of IL-1 β , IL-6, and IL-10 in adipose tissue was present in KO groups. **Conclusion:** Colorectal carcinogenesis-induced animals that lack PPAR γ presented altered glucose uptake, lower percentage of nonresident macrophages, and reduced gene expression of IL-6, IL-10, and IL-1 β in adipose tissue.

Nutrition in the Prevention and Management of COPD

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COPD is an important global health problem. In addition to pulmonary impairment, systemic inflammation, musculoskeletal abnormalities, and cardiovascular comorbidity influence disease burden and mortality risk. Body weight and body composition are important discriminants in classifying disease heterogeneity. The rationale for and efficacy of caloric supplementation in preventing and treating involuntary weight loss is currently well established. For maintenance of muscle and bone tissue, appropriately timed, high-quality protein intake and addressing vitamin D deficiency must be considered. The pharmacological potential of specific nutrients (e.g., CoQ, creatine, n-3 polyunsaturated fatty acids, resveratrol and nitrate) has been studied to boost decreased muscle mitochondrial metabolism and enhance impaired physical performance, particularly when the metabolic stimulus of physical activity alone is limited but evidence is not yet convincing. To date a multimodal nutritional approach focusing on nutrient deficiencies is recommended to enhance overall health status. At this stage, evidence is insufficient to support an intake of high doses of single nutritional supplements to modulate respiratory pathology, but some small studies have identified micronutrient modulation via the diet as a promising intervention. Overall, the evidence indicates that a well-balanced diet is beneficial to all COPD patients, not only for its potential pulmonary benefits, but also for its proven benefits in metabolic and cardiovascular risk modulation.

***Sarcopoterium spinosum* Extract for the Prevention and Management of NAFLD**

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Sarcopoterium spinosum is a medicinal plant, traditionally used for the treatment of diabetes. We had already demonstrated the glucose-lowering properties of *Sarcopoterium spinosum* extract (SSE), and found that insulin resistance is the target of its action. Recognizing the intimate link between insulin resistance and other pathologies, the aim of this study was to investigate the effects of SSE on (i) NAFLD and (ii) inflammation. In order to study its effect on NAFLD, SSE (30, 60, and 90 mg/day) was given to high fat diet (HFD)-fed and Western diet (WD)-fed mice. SSE prevented the development of hepatic steatosis in HFD-fed mice, as demonstrated by measurement of triglycerides and blinded histological evaluation of the liver. SSE treatment reduced fasting serum insulin and improved the glycemic response to insulin load, although only a minor effect on body weight was obtained. In WD-fed mice, SSE reduced serum ALT and the severity of NAFLD in a dose-dependent manner. In addition, SSE affected the expression of genes involved in lipid metabolism, inflammation, and antioxidant machinery. Next, the anti-inflammatory properties of SSE were investigated. SSE reduced the severity of adipose-tissue inflammation in two mice models of obesity and insulin resistance. The anti-inflammatory effect of SSE was studied in RAW264.7 macrophages. SSE induced a dendritic-like morphology of the cells, similarly to lipopolysaccharide (LPS) effect. However, while LPS, a pro-inflammatory agent, induced NO production and mRNA expression of pro-inflammatory cytokines, SSE increased mRNA expression of anti-inflammatory genes and blocked LPS effects. NFκB was activated by LPS, while SSE abrogated this effect. STAT3/6 were phosphorylated on tyrosine residues by SSE, but not LPS, while all three members of MAPK family were activated by LPS and SSE. In summary, SSE increased insulin sensitivity and has anti-inflammatory effects. These properties contribute to the reduced severity of NAFLD in SSE-treated mice.

Longitudinal Associations between Serum Vitamin D Levels and Health-Related Quality of Life in Colorectal Cancer Survivors Followed up for 2 Years after Treatment

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Introduction Vitamin D status may be an important determinant of health-related quality of life of colorectal cancer (CRC) survivors. The current study investigated longitudinal associations between serum 25-hydroxyvitamin D₃ (25OHD₃) levels and quality of life outcomes in stage I-III CRC survivors up to 2 years after treatment. **Methods** CRC patients ($n = 325$) were included in a prospective study upon diagnosis. Home visits were performed at diagnosis and 6 weeks, 6 months, 1, and 2 years after treatment. Serum 25OHD₃ levels were measured using liquid chromatography-tandem mass spectrometry and adjusted for season. Validated questionnaires were used to assess global quality of life and cognitive functioning (EORTC QLQ-C30), fatigue (EORTC QLQ-C30 subscale and Checklist Individual Strength, CIS), and depression/anxiety (Hospital Anxiety and Depression Scale). Statistical analyses were performed using linear mixed-models and were adjusted for sex, age at diagnosis, time since diagnosis, treatment with (neo-)adjuvant chemotherapy, treatment with radiotherapy, cancer stage, number of comorbidities, physical activity, and BMI. **Results** At diagnosis, 46% of CRC patients were vitamin D deficient (50 nmol/L). After treatment, 25OHD₃ levels increased on average with 3.1 nmol/L (95% CI 2.3, 3.9) every 6 months. In confounder-adjusted models, each increment of 10 nmol/L in 25OHD₃ concentration was longitudinally associated with increased global quality of life (β 1.5; 95% CI 0.7, 2.2) and reduced fatigue (EORTC QLQ-C30 subscale: β -1.7; 95% CI -2.6, -0.8 and CIS: β -1.2; 95% CI -2.2, -0.2). Observed longitudinal associations were present both within (i.e., within-subject changes over time) and between individuals (i.e., differences between-subjects). No associations were found with cognitive functioning and depression/anxiety. **Conclusion** Higher levels of 25OHD₃ were longitudinally associated with better global quality of life and less fatigue in CRC survivors, although effect sizes were small. Future studies are needed to corroborate these findings and identify biological mechanisms underlying these associations.

Synergic Effect of High Dose of Vitamin D₃ and 17 β -Estradiol in Long-Term Ovariectomized Rats in Chronic Unpredictable Mild Stress: NF-kB and BDNF Implications

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The therapeutic effects of Vitamin D₃ on the chronic unpredictable mild stress (CUMS) model of depression in the long-term ovariectomized (OVX) rats remain unknown. The purpose of this study was to explore the antidepressant-like effects of Vitamin D₃ at different doses (1.0, 2.5, and 5.0 mg/kg, s.c.) on the model of depression produced by chronic unpredictable mild stress (CUMS) for 28 days in the long-term (3 months) adult OVX rats and OVX rats given 17 β -estradiol. Sucrose preference test (SPT), forced swimming (FST), and open-field (OFT) tests were conducted to examine depression-like state. Determination of serum Vitamin D₃ and estradiol levels as well as hippocampal BDNF and NF-kB expressions by ELISA kits and/or Western blotting were made to assess the possible mechanisms of Vitamin D₃ effects on the depression-like profile in the long-term OVX rats and OVX rats treated with 17 β -estradiol subjected to CUMS. The results showed that Vitamin D₃ (5.0 mg/kg), as well as fluoxetine treatments, considerably reversed the depression-like state in the SPT and FST and increased BDNF and NF-kB levels in the hippocampus of long-term OVX rats as compared to the OVX rats with CUMS plus solvent ($p < 0.05$). However, Vitamin D₃ (1.0 mg/kg) alone in a combination with 17 β -estradiol significantly exacerbated depression-like behavior in the SPT and FST in the long-term OVX rats as compared to the OVX rats with CUMS plus solvent and control rats ($p < 0.05$). Moreover, Vitamin D₃ (2.5 mg/kg) was not effective in modifying depression-like behavior in the long-term OVX rats with CUMS. Thus, a high dose of Vitamin D₃ (5.0 mg/kg, s.c.) could improve the depression-like profile in the adult long-term OVX female rats subjected to the CUMS procedure, which might be mediated by regulation of BDNF and NF-kB signaling pathways in the hippocampus.

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Goat Milk Consumption Ameliorated Abnormalities in Glucose Metabolism and Enhanced Hepatic and Skeletal Muscle AMPK Activation in Rats Fed with High-Fat Diets

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Background and aims. Many Traditional Chinese Medicine books mention that goat milk consumption could ameliorate the symptoms of diabetes. However, this documentation has never been officially validated by modern science. Our aim of the present study was to test the hypothesis that goat milk consumption could ameliorate abnormalities in glucose metabolism in high-fat diet-induced diabetic rats. **Materials and methods.** Purified high-fat diets with 60% of energy derived from fat were used in this study. We prepared 4 different isocaloric high-fat diets: (1) Goat milk-based high-fat diet (GHF; 30% by weight goat milk powder), (2) cow milk-based high-fat diet (CHF; 30% by weight cow milk powder), (3) high-fat diet (HF; lard-based), and (4) high-fat diet plus acarbose (HF+A; supplemented with 0.04% acarbose). Weanling male Sprague-Dowley rats were randomly assigned to each diet ($n = 12$). **Results.** After 24 weeks of feeding, fasting glucose levels, area under the curve in insulin tolerance tests, HbA1c levels, and total cholesterol levels were significantly lower in both GHF and CHF rats as compared to HF rats. AMPK activation in the liver and skeletal muscle was significantly higher in GHF rats than in HF rats. We observed that PEPCK and G6Pase mRNA expression in the liver was significantly lower, and HK2 mRNA expression in the skeletal muscle was significantly higher in GHF rats than in HF rats. Our observations suggest suppressed hepatic gluconeogenesis and enhanced glucose utilization by the skeletal muscle in GHF rats as compared to HF rats. There was no difference in AMPK activation, hepatic gluconeogenesis, and glucose utilization in skeletal muscle when we compared CHF rats with HF rats. Additionally, no difference was found in the cellular signaling pathways between GHF and HF rats as well as between CHF and HF rats. **Conclusion.** The results of the present study agree with the documentation that goat milk consumption could ameliorate the symptoms of diabetes.

Abstracts

Session 2. Nutrients and the Microbiome

Gut Microbiota Composition and Diversity Associated with Dietary Intake in Korean Adults

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Human gut microbiota could be modulated by diet, which may affect the status of human health and disease. This study aimed to investigate the effect of dietary intake at food and nutrient levels on gut microbiota composition and diversity and to identify specific dietary patterns associated with gut microbiota diversity in Korean healthy adults. This cross-sectional study included 223 healthy subjects aged 18–60 years. Gut microbiota composition and diversity data were obtained by 16S rRNA gene sequencing of DNA extracted from fecal samples. Dietary intake was collected by food frequency questionnaires. Associations of dietary intake with taxonomic relative abundance and alpha-diversity of gut microbiota were evaluated by correlation analysis with age, sex, BMI, and smoking status as covariates. The pattern of gut microbiota diversity over the study population was explored by beta-diversity. Reduced rank regression analysis was conducted to identify specific dietary patterns associated with gut microbiota diversity. Higher intakes of vegetables, fermented legumes, plant-based protein, and dietary fiber were associated with a higher Firmicutes/Bacteroidetes ratio (F/B ratio) and higher α -diversity of gut microbiota. Higher intake of poly-unsaturated fatty acid was positively associated with higher presence of Firmicutes. High intakes of cereal products and non-alcoholic beverages (except for coffee and tea) were negatively associated with the F/B ratio. Higher presence of Actinobacteria was related to high intake of dairy products. A dietary pattern characterized by high intake of vegetables, fermented legumes, multi/whole grains, fish, and tea and low intake of non-alcoholic beverages was associated with higher α -diversity and higher F/B ratio. In this study population of Korean adults, dietary intake was associated with gut microbiota composition and diversity. We also identified a specific dietary pattern associated with gut microbiota diversity. Whether these modulations of the gut microbiota by Korean dietary patterns affect host health should be investigated in future studies.

Diet Composition, Gut Microbiome, and Obesity in Children with Prader–Willi Syndrome

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Prader–Willi Syndrome (PWS) is the most frequent cause of genetic obesity. Major clinical manifestations include hyperphagia, altered body composition, obesity, and behavioral problems. A strict supervision of the diet, including caloric restriction, from early ages significantly determines subsequent evolution. However, the role of dietary nutritional composition and the gut microbiome in weight control of these patients remains unclear. We studied the nutritional composition of the diet of a cohort of children with genetic diagnosis of PWS ($n = 31$, 19 girls, 12.0 ± 4.0 years old, BMI–SDS 1.42 ± 1.44). Hyperphagia was assessed with a specific questionnaire for PWS (HQ-CT), and nutritional analysis with a 4-day food record. Fecal samples were analyzed by 16S sequencing to determine microbiota composition. Linear multivariate regression was applied to assess associations between BMI–SDS and the different variables, adjusting for age, sex, and caloric intake. Correlations with gut microbiota were assessed with Spearman’s nonparametric test. Dietary macronutrient distribution in these patients was within the recommended range (18 ± 3 protein, 46 ± 6 carbohydrate, and 33 ± 6 fat, as percentage of calories). BMI–SDS was not associated with hyperphagia score ($p = 0.207$) or caloric intake ($p = 0.494$). Notably, BMI–SDS was significantly associated with percentage saturated fat intake ($p = 0.003$). Regarding food groups, BMI–SDS was strongly associated with meat ($p = 0.001$) and inversely with fruit intake ($p = 0.002$). The gut microbiome was characterized by high relative abundance of the genera *Bifidobacterium* ($11.5 \pm 5.3\%$) and *Blautia* ($11.6 \pm 4.7\%$). BMI–SDS showed a significant direct correlation with *Eubacterium* ($p = 0.046$) and inverse with *Alistipes* ($p = 0.001$) and *Christensenella* ($p = 0.001$). Interestingly, meat intake was also directly correlated to *Eubacterium* ($p = 0.018$) and inversely correlated to *Alistipes* ($p = 0.037$) and *Christensenella* ($p = 0.002$) relative abundance. Our results suggest that limiting meat and increasing fruit intake could be beneficial for body weight control in children with Prader–Willi syndrome.

Drug Treatments Partially Determine the Effects of Pomegranate Consumption on the Gut Microbiota of Polymedicated Metabolic Syndrome Patients

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Gold-standard treatments (statins, antidiabetic, and hypotensive drugs) are used to manage the cardiovascular-associated risk in metabolic syndrome (MetS) patients. MetS patients harbor a gut microbiome in dysbiosis, and it is known that medication affects the microbiota. Pomegranate exerts in vivo anti-inflammatory and prebiotic effects. We aimed to evaluate the effect of a pomegranate extract (PE) on metabolic and inflammatory markers as well as on the modulation of the gut microbiota in MetS patients, and whether the medication could determine these effects. In a randomized, double-blind, placebo-controlled, and crossover trial, 54 MetS patients consumed daily 900 mg PE or placebo for 1 month, alternating with 1 month of wash-out. A total of 46 serobiochemical variables were determined by automated analyzers, 17 metabolic and inflammatory markers (P-selectin, ghrelin, etc.) by multiplex immunoassay kits, and the gut microbiome by Illumina MiSeq. Baseline levels of some markers were affected by the patients' medication. ICAM-1 and RBP4 were significantly lower in patients treated with statins and antidiabetics, respectively; while resistin and ghrelin were higher in hypertensive-treated patients. The abundance of 13 microbial groups was lower in statin-treated patients, including *Bifidobacterium* and *Lactococcus*, whose levels increased after PE consumption. A total of 21 bacterial groups were lower in antidiabetic-treated patients, including *Peptostreptococcaceae* and *Clostridiaceae*, as well as *Clostridium sensu stricto*, whose levels decreased even more after PE consumption in these patients; while the levels of *Bifidobacterium* and *Lactococcus* increased. Finally, the microbiome of antihypertensive-treated patients was enriched in 20 groups that were not affected by PE, which otherwise increased particularly in these patients *Gordonibacter* and *Lactococcus*, and decreased *Clostridium sensu stricto* and *Erysipelotrichaceae_incertae_sedis*, among others. The gold standard medication also affects metabolic and inflammatory markers that are not a clinical target of said medication. These treatments also shape the gut microbiota of patients and partially determine the modulation effect of PE consumption.

Mother–Offspring Transmission of Immunoglobulins and Microbiota through Breast Milk in Rats

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Breast milk is the major source of energy for the breastfed infant. Nevertheless, it also contains bioactive compounds such as immunoglobulins (Ig) that cover the low production in the newborn. Moreover, it has its own microbiota, which promotes the colonization of the intestinal environment and supports the development of the immune system in the offspring. The aim of the present study was to establish the composition of Ig and microbiota in the plasma and breast milk of dams and in the plasma of pups. Moreover, the relationship between them in the three compartments was studied in order to determine how mother–offspring transfer was produced. The animals were monitored during the three weeks of gestation and the first two weeks of lactation. At the end of this period, dams and pups were sacrificed in order to obtain plasma and lactic serum for the analysis of Ig by Luminex® technique and whole milk and cecal content to study the microbiota composition by 16S V3-V4 rRNA Illumina sequencing. IgG dominated in all three compartments, accounting for more than 85% of the Ig. Moreover, levels of IgG in milk and plasma of dams and pups were strongly linked because positive correlations between all IgG subtypes with their respective Ig in the other compartments were found. Conversely, the content of IgM and IgA did not show relevant correlations between dam–milk–pup. All three compartments shared up to 40 genera, some of which displayed positive correlations with Ig (e.g., *Enterococcus*, *Streptococcus*, and *Lachnoclostridium*). Overall, we established the breast milk composition of Ig and microbiota in rats and found evidence of the transmission from the dam to the pup. Hence, nutritional interventions in the mother directed at improving the quality of Ig or microbiota of the breastmilk might be useful to modulate those components in the newborn.

Abstracts

Special Session: Cognitive and Mental Health

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Nut Consumption Correlates with Women's Cognition and Mood

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Multiple studies have shown a Mediterranean diet to be correlated with cognitive status and lower depression risk. To examine whether part of this reduced risk in the United States is attributable to nut consumption we analyzed data on all nut and compared it with walnut consumption among adults living in the United States. We employed dietary data from a nationally representative sample of the US collected between the years 2005 and 2014, along with their depression scores based on PHQ-9 self-report responses and a neurobehavioral evaluation consisting of simple reaction time (SRTT), symbol digit substitution (SDST), the single digit learning (SDLT), Story Recall (SRT) and digit-symbol substitution (DSST) tests from the same subjects. We characterized 26,656 participants as reporting consumption of walnuts with high certainty, consuming walnuts with other nuts, eating primarily other nuts, or having no nut consumption. After adjustment for covariates, walnut consumers showed lower depression scores compared to non-nut consumers. Least square mean for total depression score were 26% lower for walnut with high certainty consumers than for non-nut consumers ($p < 0.0001$) and the association was stronger among women (32%, $p < 0.0001$) than men (21%, $p = 0.05$). The significant contributors to this difference were due to walnut consumers reporting greater interest in doing things ($p = 0.003$), less hopelessness ($p = 0.02$) and feeling more energetic ($p = 0.05$) than non-nut consumers. Non nut consumers were more likely to have trouble concentration ($p = 0.02$), to feel they were moving or speaking abnormally ($p = 0.03$) and to have thought they were better off dead ($p = 0.002$). As for their cognitive function, adults 20–59 years old reporting walnut consumption of an average of 10.3 g/d required 16.4ms less time to respond on the SRTT, $p = 0.03$, and 0.39s less for the SDST, $p = 0.01$. SDLT scores were also significantly lower by 2.38s ($p = 0.05$). Similar results were obtained when amounts of walnut consumption were examined in trend analyses. Significantly better outcomes were noted in all cognitive test scores among those with higher walnut consumption ($p < 0.01$). Among adults 60 years and older, walnut consumers averaged 13.1 g/d, scored 7.1 percentile points higher, $p = 0.03$ on the SRT and 7.3 percentile points higher on the DSST, $p = 0.05$. Here also trend analyses indicate significant improvements in all cognitive test scores ($p < 0.01$) except for SRTT ($p = 0.06$) in the fully adjusted models. **Conclusions:** Depression scores were significantly lower among nut consumers and particularly walnut consumers as compared to non-nut consumers in this cross-sectional study of Americans. The difference was strongest among women, who are more likely than men to report higher depression scores. Significant, positive associations between walnut consumption and cognitive functions among all adults, regardless of age, gender or ethnicity suggest that daily walnut intake may be a simple beneficial dietary behavior. These results will be discussed in the context of recent findings in other populations.



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Abstracts

Session 3: Bioactive/Functional Foods

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The Role of Nuts in the Prevention and Management of Chronic Diseases

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Nuts contain a range of nutrients, including antioxidant phytonutrients, vitamins, minerals, fiber, and unsaturated fatty acids, which are potentially protective against a range of chronic diseases. Epidemiological studies consistently report that nut consumption is associated with lower incidence of cardiovascular disease, coronary heart disease, stroke, and hypertension, but inconsistent associations have been found for nut consumption and a reduced incidence of type 2 diabetes mellitus. Intervention studies using a range of tree nuts and peanuts have found beneficial effects on many cardiovascular and metabolic biomarkers with effects influenced by dose, length of supplementation, background diet quality, and population demographics. There is some evidence that nuts can also reduce the incidence of non-alcoholic fatty liver disease (NAFLD) and change the composition and function of the gastrointestinal microbiota, which may help to understand the underlying mechanisms associated with the beneficial health effects associated with nuts. Furthermore, there is growing interest in the potential of nuts to contribute to delay in cognitive decline associated with aging. This presentation will give an overview of the evidence to date for the role of nuts in the prevention and management of chronic diseases.

Effects of Anthocyanins Consumption on Markers of HDL Function in Humans

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The epidemiological studies, human interventions, and animal interventions have suggested that anthocyanins' consumption would decrease the risk of CVD and modulate the cholesterol metabolisms; however, the mechanism remains elusive. It was proposed that improving the atheroprotective function of HDL would be the mechanism by which anthocyanins would exert their action. Paraoxonase 1 (PON1) contributes to many atheroprotective functions of HDL, such as reverse transport of cholesterol and prevention of LDL from oxidation. PON1 activities are influenced by several factors—most importantly, diet and genetic polymorphism. The results from a nutrigenetic observational study identified protective genotypes of PON1 that were associated with increased HDL under anthocyanins consumption. However, the interaction between PON1 and anthocyanins consumption is relatively unknown. Additionally, the effects of anthocyanins on lactonase and the physiologically-relevant activity of PON1 have not been explored yet. Furthermore, the interaction between anthocyanins and PON1 genetic variants remains to be investigated. Therefore, the present study was conducted to investigate the ability of two types of anthocyanins to increase PON1 arylesterase and lactonase activities considering the genetic polymorphism of PON1 in humans. In three-arms placebo-controlled cross-over intervention, 52 hypercholesterolemic individuals who genotyped for 192Q/R and 55L/M genotypes were given capsules containing either bilberry extract or black rice extract that provided 320 mg anthocyanins/day for 28 days. PON1 activities, HDL subspecies, and other biomarkers associated with HDL function and CVD were assessed in serum. PON1 activities remained unchanged after treatments whatever the genotype was, which consisted of the *in vitro* work. Additionally, no significant differences were observed in total HDL, HDL2, HDL3, ApoA1, ApoB1 or lipid profile in humans after anthocyanin consumption. It can be concluded that anthocyanin consumption did not confer a protective effect toward PON1 and HDL function biomarkers *in vivo*. The lack of effects may be due to the short duration of intervention.

Emodin Inhibits Histone Deacetylase (HDAC) Activity and Pathological Cardiac Hypertrophy

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Epigenetic modifications regulate gene expression without changing DNA sequence and are reversible, highlighting their preventative and therapeutic potential for heart failure. Recent evidence suggests that food compounds can reverse these stress-induced epigenetic modifications, yet few studies have characterized their role as epigenetic regulators of heart health. Our objective tested the hypothesis that Emodin, an Anthraquinone found in rhubarb, blocked pathological cardiac hypertrophy via acetyl-histone-mediated gene expression changes. To test this hypothesis, neonatal rat ventricular myocytes (NRVMs) were stimulated with phenylephrine (PE, 10 μ M) or phorbol myristate acetate (PMA; 50 nM) to induce receptor-mediated and intracellular-mediated pathological cardiac hypertrophy in the absence or presence of vehicle control or Emodin (10 μ M) for 48 hours. Cells were subsequently (1) fixed for immunostaining and cell size quantification, (2) lysed for protein to assess histone deacetylase (HDAC) activity and histone acetylation or (3) lysed for RNA to analyze transcriptome-wide changes in gene expression. A minimum of three experiments with an $n = 3$ /group was performed and data quantified. Lastly, an animal model of angiotensin II (Ang II)-mediated cardiac remodeling was used to examine the preventative and inhibitory actions for Emodin on heart size and HDAC activity. One-way ANOVA with Tukey's post-hoc was performed unless otherwise specified. $p < 0.05$ was considered significant. Emodin significantly blocked PE- and PMA-induced hypertrophy in cell culture and animals. Emodin significantly inhibited HDAC activity concomitant to increased histone acetylation. Lastly, Emodin reversed stress-induced changes in gene expression, with similar overlap observed in the transcriptome between Emodin and a well-studied HDAC inhibitor trichostatin A (TSA). Our data suggest that Emodin inhibited pathological cardiac hypertrophy via HDAC inhibition and increased histone acetylation, leading to transcriptome-wide changes in gene expression. Animal studies confirmed our in vitro findings, thus supporting the role for food compounds like Emodin as epigenetic regulators of heart health.

Cocoa Extract Supplementation Improves High Fat Diet-Induced Obesity, Hepatic Steatosis, Insulin Resistance, and Glucose Intolerance in Wistar Rats

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Foods rich in polyphenols and other phenolic compounds have emerged as a strategy to prevent obesity and other metabolic syndrome-related diseases. Among them, cocoa (*Theobroma cacao* L.) polyphenols have been described as a potential therapy to mitigate metabolic syndrome-features, mainly attributed to putative antioxidant, hypotensive, and antidiabetic activities.

However, the potential application of cocoa extracts as supplements for the control of obesity-related manifestations, such as excessive body weight gain or visceral adiposity, is still barely evaluated. The differences in the origin of the cocoa beans, the extraction methods or the methodology applied make the comparison among studies difficult. Moreover, the doses used in some trials complicate the extrapolation of the results to human studies. Subsequently, the mechanisms involved in the cocoa anti-obesity effects are poorly understood. In this study, it was proven that supplementations with low doses (14 and 140 mg/kg/rat) of a complete ethanolic cocoa extract for 10 weeks are able to ameliorate different associated disturbances of metabolic syndrome in a diet-induced obesity (DIO) model of Wistar rats. Cocoa extract-supplemented animals showed significantly reduced body weight gain and food efficiency, without differences in energy intake. Cocoa reduced epididymal, retroperitoneal, and subcutaneous fat accumulation, accompanied by a significant reduction in the adipocyte size. These effects were mediated by the downregulation of some adipogenesis and lipogenesis-specific genes like *Cebpa*, *Fasn* and *Adipoq*. Additionally, cocoa extract contributed to improving insulin sensitivity (determined by the HOMA-IR index) and glucose tolerance. Finally, cocoa extract administration ameliorated the lipid profile, as it reduced the log (TAG/HDL) ratio and the dietary-induced liver steatosis. Current data suggest that low doses of cocoa supplementation may be able to counteract obesity and type-2 diabetes in a rodent model and envisages a possible use in the management of metabolic syndrome in humans.

Effect of the Roasting on the In Vitro Bioactivity, Phenolic, Oxylipins, and Fatty Acids of the Chilean Hazelnut (*Gevuina avellana* Mol., Proteaceae)

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The roasted cotyledons of the Chilean hazelnut (*Gevuina avellana*, Proteaceae) are appreciated as snacks in Chile and Patagonia. The aim of the present study was to assess the fatty acid, oxylipin, and phenolic content and composition, as well as their bioactivity, in raw and roasted samples of the cotyledons. The cotyledons have a high content of lipids. The main fatty acids in the cotyledon oil were oleic acid and 7-hexadecenoic acid. Eight phytoprostanes and three phytofurans were identified and quantified. The oils showed antioxidant capacity determined by electron paramagnetic resonance (EPR), and inhibitory effect against pro-inflammatory enzymes. The roasting process changed the oxylipin profile of the samples. Hydroxybenzoic acid and hydroxycinnamic acid were the main phenolic compounds identified in the phenolic-enriched extracts (PEE) of the cotyledons. The PEEs presented a mild antioxidant effect, inhibited α -glucosidase, but neither amylase nor lipase. The roasting process did not affect the composition and bioactivity of the samples. The occurrence of oxylipins in this species is reported here for the first time. Chilean hazelnuts can be considered a valuable source of health-promoting compounds.

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Circulating Metabolites Associated with Red Wine Consumption

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Background: The relationship between red wine (RW) consumption and metabolism is poorly understood. The aim of this study was to assess the circulating metabolomic profiles in relation to frequent RW consumption as well as the ability of a set of metabolites to discriminate RW consumers from nonconsumers. **Methods:** Cross-sectional analysis of 1157 participants from the PREDIMED study. Subjects were divided according to RW consumption: nonconsumers versus consumers of >1 glass (100 mL/day) at baseline. Plasma metabolomics analysis was performed using two methods based on liquid chromatography–mass spectrometry. Associations between 387 identified metabolites and RW consumption were assessed using elastic net regression analysis, taking into consideration baseline significant covariates. Ten-cross-validation (CV; 90% training, 10% validation) was performed, and receiver operating characteristic (ROC) curves were constructed in each of the validation datasets based on weighted models. **Results:** A set of 33 metabolites were selected at least one time in the elastic net logistic regression. Out of them, a subset of 13 metabolites was consistently selected in all the 10 CV iterations, discriminating RW consumers versus nonconsumers. Based on the multimetabolite model weighted with the regression coefficients of metabolites and selected covariates, the area under the curve (AUC) was 0.82 (95% CI: 0.79–0.86). These metabolites mainly consisted of lipid species (e.g., triglycerides and phosphatidylcholines), some organic acids, and alkaloids. **Conclusion:** A multimetabolite model identified in a Mediterranean population appeared useful in discriminating between frequent RW consumers and nonconsumers. Further studies are needed to assess the contribution of the identified metabolites in health and disease.

A Dietary Polysaccharide from *Eucheuma cottonii* Modulates the Inflammatory Response and Suppresses Osteoarthritis-Associated Cartilage Degradation in a Rat Model of Obesity

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Osteoarthritis (OA) is a common form of arthritis diseases, characterized by degeneration of articular cartilage and leading to joint dysfunction. Oral drug therapy seems to ameliorate some signs and symptoms of OA, but it might be accompanied by side effects and seem not effective for a long time. Seaweed has received much attention in the pharmacological field owing to its various biomedical properties, including the anti-inflammation, antitumor, and antioxidant effects. Therefore, this study investigated the ameliorative effects of a dietary polysaccharide from *Eucheuma cottonii* extract (ECE) on an anterior cruciate ligament transection with partial medial meniscectomy surgery (ACLT + MMx) to induce osteoarthritis (OA) in high-fat diet (HFD)-induced obese rats. The male Sprague–Dawley rats were fed an HFD for 12 weeks before ACLT + MMx surgery, after which they were administered a daily oral gavage of saline (Sham, OB Sham, OBOA), either low-dose ECE (100 mg/kg body weight) or high-dose ECE (400 mg/kg body weight), or glucosamine sulfate as a positive control (OBOAGS; 200 mg/kg body weight) for 5 weeks. Treatment with ECEs decreased the body weight, triglyceride, and total cholesterol (TC) levels, and the TC/high-density lipoprotein (HDL)-C ratio in obese rats. Additionally, ECE downregulated the expression of proinflammatory cytokines, including tumor necrosis factor- α , interleukin-1 β , and leptin, and suppressed nuclear factor-kappa B and extracellular-signal-regulated kinase-1/2 expression, resulting in decreased levels of matrix metalloproteinase (MMP)-1 and -13 and prostaglandin-E2 and attenuated cartilage degradation. These results demonstrated that the dietary polysaccharide from ECE suppressed OA development in obese rats, suggesting its potential efficacy as a promising candidate for OA treatment.

Pre-clinical Protein Screening in Bioengineered Intestinal Tubules

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The increasing world population goes hand in hand with an increase in food demand. Therefore, the need for sustainable nutrition grows. In the search for novel foods, safety and efficacy testing are of utmost importance. After oral ingesting, the first organ system with which there is direct interaction is the gastrointestinal tract. The small intestine plays a key role in the selective absorption and first line of defense via its epithelial barrier. For preclinical screening, the bioengineered intestinal tubules were developed earlier. The bioengineered intestinal tubules make use of Caco-2 cells cultivated on hollow fiber membranes under physiological relevant shear stress, resulting in the presence of key features of the small intestine; a 3-dimensional tube structure, formation of a functional epithelial barrier, differentiation in the main small intestinal cell types, and villi-like structures. In our model, 14 different in vitro digested proteins of different origins (e.g., insect, corn, and blood plasma) were screened. The experiment's ready bioengineered intestinal tubules were either exposed to only protein digest (3 h) or an barrier disruptive challenge (24 h) prior to protein digest (3 h) exposure. Thereafter, the leakiness of the Caco-2 monolayer was evaluated via inulin-FITC leakage and quantification of zonula occludens-1 immunostainings. Cell viability and alkaline phosphatase activity were determined; the latter is known to decrease the toxicity of LPS, and an increased activity is therefore considered beneficial. In the supernatant, immune modulators (e.g., IL-8 and IL-6) and nitric oxide was quantified as markers for inflammation and tissue repair. Here, we show the applicability of the bioengineered intestinal tubules as a preclinical screening device for novel proteins.

High Pressure Extraction Conditions Influence the Antibacterial and Bifidogenic Properties of Bioactives from the Macroalgal Species *Laminaria hyperborea*

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Seaweeds-derived bioactives have health-promoting properties. However, their functionality depends on the extraction method/conditions used. The objectives of this study were to determine the antibacterial and bifidogenic potential of: (1) the whole seaweed biomass of *Laminaria hyperborea* (LH) and (2) two extracts (LH1 and LH2) generated using high pressure-assisted extraction methodology with water as solvent and two different combinations of temperature, incubation time, and LH:solvent ratio. LH was added to diluted feces from newly-weaned piglets at 5, 1 or 0 mg/mL. The incubation conditions were 39 °C for 24 h at 100 rpm with sampling at 0, 10, and 24 h. After centrifugation, DNA was extracted from the pellet. The experiment was replicated in triplicate. The log gene copy number/g digesta of bifidobacteria and *Enterobacteriaceae* were determined by quantitative PCR. Data were analyzed by repeated-measures using PROC MIXED (SAS 9.4). Bifidobacteria were undetectable, and *Enterobacteriaceae* were reduced at 5 mg/mL LH compared to the 0 mg/mL ($p < 0.05$). LH-1 and LH-2 extracts were two-fold diluted from 2 mg/mL to 0.25 mg/mL and incubated with *Bifidobacterium thermophilum* (BT) or *Salmonella* Typhimurium (ST) for 18 h at 37 °C. Controls (0 mg/mL) were included. Final bacterial concentrations were determined by spread plating. The experiment was replicated in triplicate. Data were analyzed using PROC GLM (SAS 9.4). LH-1 reduced BT (1 Log colony forming unit (LogCFU)/mL, $p < 0.05$) and ST (5.2 LogCFU/mL, $p < 0.05$) at 2 mg/mL. LH-2 extract increased BT (≤ 0.7 LogCFU/mL, $p < 0.05$) at 1 and 2 mg/mL but had no effect on ST. In conclusion, different extraction conditions led to LH extracts with both improved and specific activity in vitro; LH-1 being antibacterial; and LH-2 being bifidogenic.

Abstracts

Session 4: Mediterranean Diet

Role of Mediterranean Diet in the Prevention and Management of Obesity and Diabetes Mellitus

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We summarize the current scientific evidence from epidemiological studies and clinical trials on the relation between the MedDiet, obesity, metabolic syndrome and T2D, as well the possible mechanisms underlying the reported associations. A meta-analysis of prospective studies showed that greater adherence to the MedDiet was associated with a significant reduction in the risk of T2D. Several studies have also demonstrated an inverse association between the adherence to MedDiet and weight gain or the risk of obesity. However, few randomized controlled trials (RCTs) have evaluated the effect of the MedDiet on T2D and MetS management. Results from the PREDIMED intervention trial showed that participants assigned to the MedDiet had a significant reduction in the risk of T2D and promoted the reversion of MetS. Some RCTs also showed the beneficial effects of the MedDiet on glycemic control in patients with T2D. Few studies have also evaluated in diabetic individuals the effect of MedDiet on diabetic complications. Since there are no clinical trials demonstrating that sustained weight loss over >2 years with diet and changes in lifestyle reduce the risk of cardiovascular disease, we have also designed the PREDIMED-PLUS Study, a parallel group, multi-centre, randomised, primary prevention trial (PREDIMED-PLUS) on men and women aged 55–75 years, with overweight/obesity and MetS. The objective of the present research is to compare the cardiovascular effect of two interventions: (a) intensive weight-loss intervention on lifestyle with hypocaloric MedDiet, physical activity promotion, and behavioural support, (b) non intensive care with recommendations on MedDiet. The principal end-points are a composite of major hard cardiovascular events and weight loss and maintenance at long term. 6874 participants have been randomized and the final results will be available from 2020. We will present the pilot results of this trial at one year.

Role of the Mediterranean diet in the prevention of Alzheimer disease

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A healthy lifestyle is protective against age-related disorders. Nutrition is a critical component of lifestyle, and there is consistent scientific evidence that adhering to healthy plant-based diets is associated with reduced rates of non-communicable diseases such as cardiovascular diseases, cancer and neurodegenerative disorders. One such healthy dietary pattern, reputed for its long-ranging health benefits, is the Mediterranean diet (MeDiet). The traditional MeDiet is characterized by customary use of olive oil in the kitchen and at the table; high consumption of fruit, vegetables, legumes, cereals, and nuts; regular but moderate intake of wine with meals; moderate consumption of seafood, fermented dairy products (yogurt and cheese), poultry and eggs; and low consumption of red and processed meats, sweets and sugar-sweetened beverages. There is reasonable evidence from prospective studies suggesting that adherence to Mediterranean-style diets is associated with a reduced risk of dementia in general and of Alzheimer disease (AD), the most common form of dementia, in particular. The MeDiet has also been associated with a reduced incidence of stroke and type-2 diabetes, two strong links with AD mediated in part via vascular changes in the brain. Furthermore, brain integrity, as assessed by magnetic resonance imaging, appears to be preserved in older populations following the MeDiet. Finally, both prospective studies and randomized clinical trials have shown that adherence to the MeDiet counteracts age-related cognitive decline, a harbinger of AD. The PREDIMED study is the only long-term randomized clinical trial that has examined MeDiets (supplemented with extra-virgin olive oil or mixed nuts) versus a low-fat diet for cognitive outcomes in older individuals at high cardiovascular risk. Results have shown benefit of the MeDiet against age-related impairment of memory, executive function and global cognition. In conclusion, consistent epidemiological and clinical trial evidence point to the MeDiet as a useful tool in the prevention of AD.

Effects of a Mediterranean Diet Associated to a Program of Physical Activity and Behavioral Support on the Biomarkers of Inflammation of Atheroma Plaque Stability in the Vascular Wall in People with High Cardiovascular Risk

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Background: Adherence to a Mediterranean diet pattern is associated with an immunomodulatory effect on the inflammatory molecules with an increase in serum markers of atheroma plaque stability. **Aim:** To assess the effect of an intensive weight-loss-oriented lifestyle intervention program based on a traditional Mediterranean diet (MD) after 1 year of intervention on inflammatory biomarkers of atherosclerosis and plaque vulnerability in a subcohort of the PREDIMED PLUS study. **Methods:** We selected 150 older individuals with overweight/obesity and ≥ 3 criteria for the metabolic syndrome (MetS) from primary care centers affiliated with the Hospital Clinic of Barcelona. They were randomly assigned to 2 intervention groups: a traditional MD as the control group (CG) or an energy-restricted MD plus intensive lifestyle intervention group (ILI). It was a randomized field trial. At baseline and after 1 y, we evaluated changes on inflammatory biomarkers MMP-9 and endothelin-1 by enzyme-linked immunosorbent assay (ELISA). **Results:** Compared to volunteers in the nonrestrictive Mediterranean diet, those who received a caloric-restrictive Mediterranean diet and an intensive intervention on lifestyle showed a higher decrease in systolic (6.2 mmHg) and diastolic (1.8 mmHg) blood pressure, as well a reduction of 5% in triglycerides ($p = 0.047$), respectively. In addition, inflammatory biomarkers related to endothelial dysfunction and fibrosis markers such as MMP-9 and endothelin-1 were reduced with a statistical significance ($p < 0.05$; both). **Conclusion:** Adherence to the Mediterranean diet pattern associated to a program of physical activity and behavioral support is associated with a decreased in serum markers of endothelial dysfunction, fibrosis markers, and arteriosclerosis classic markers.

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The Effects of the Mediterranean Diet on Gene Expression Related with Cardiovascular Disease

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Introduction: A reduced incidence of coronary heart disease and mortality is associated with a higher adherence to a Mediterranean diet (MD). The signaling pathways related to atherogenesis that could be affected by the MD at gene levels are still unknown. **Methods:** A total of 285 participants in the PREDIMED trial were randomly assigned into 3 intervention groups: MD supplemented with extra-virgin olive oil (MD-EVOO) or nuts (MD-Nuts), and a low-fat diet (LFD). Fourteen plasma inflammatory biomarkers and high-sensitivity C-reactive protein (hs-CRP) were determined by Luminex and standard enzyme-linked immunosorbent assay, respectively, at baseline and after 3 years. In addition, the expression of 10 genes related to atherosclerosis was determined by RT-PCR. **Results:** After 3 years, participants following one of the two MDs showed significantly decreased plasma levels of MCP-1 ($p < 0.001$, both), MIP-1 β ($p < 0.036$, both), ENA78 ($p < 0.001$, both), IL-1 β ($p < 0.05$, both), IL-6 ($p < 0.014$, both), IL-8 ($p < 0.034$, both), TNF- α ($p < 0.047$, both), IFN- γ ($p < 0.027$, both), and hs-CRP ($p < 0.015$, both), while no significant changes were observed in these biomarkers in the LFD group ($p > 0.05$), except for hs-CRP that showed a trend toward reduction ($p = 0.066$). We detected a significant increase ($p < 0.05$) in gene expression levels for TLR2 and CCR2 by 10%, TLR6 by 10%, CCR5 and CXCR3 by 6%, and CXCR2 by 23% and after 3 y of LFD. **Conclusions:** An MD pattern decreases plasma levels of inflammatory molecules and avoids changes in gene expression related to atherosclerosis after 3 years in elderly subjects at high cardiovascular risk, while an LFD promotes gene expression of inflammatory markers. These results could imply that the MD modulates inflammation related to aging over time.

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Dietary Strategies to Reduce Metabolic Syndrome

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Metabolic syndrome (MetS), is a cluster of metabolic abnormalities characterized by central obesity, dyslipidemias, hypertension, high fasting glucose as well as chronic low-grade inflammation and oxidative stress. MetS increases the risk of heart disease by two-fold and five-fold for type-2 diabetes documenting a strong association to chronic disease. This condition has become an increasing problem in our society where about 34% of adults are diagnosed with MetS. In parallel with the adult situation, a significant number of children present lipid abnormalities and insulin resistance, which can be used as markers of MetS in the pediatric population. Changes in lifestyle including healthy dietary regimens and increased physical activity should be the first lines of therapy to decrease MetS. In this presentation, I will discuss the most recent information on successful dietary modifications that can improve the parameters associated with MetS. Successful dietary strategies include caloric restriction and weight loss, manipulation of dietary macronutrients (either through restriction of carbohydrates, fat, or enrichment in beneficial fatty acids), incorporation of functional foods and bioactive nutrients as well as adherence to dietary/lifestyle patterns such the Mediterranean diet. Together, the recent findings that will be presented, serve as evidence to support the therapeutic treatment of MetS through diet.

The Mediterranean Diet and Chronic Diseases—Results from a National-Based Australian Study

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The Mediterranean diet (MD) has been recognised by UNESCO as one of the healthiest in the world. A large body of literature exists showing the beneficial effects of the MD diminishing the risks of various chronic diseases, such as cardiovascular (CVD), obesity, hypertension, diabetes, and/or cognition. Not surprisingly, the majority of studies was developed in Europe. In contrast, research studying the degree of implementation of the MD in Australia and its long-term effects on health has captured little attention to date. In the current study, we tested the hypothesis that adherence to an MD-like food pattern improves the healthy status of Australians. The Australian Health Survey (AHS) is the largest and most comprehensive health study conducted in Australia this century and includes the first nutrition-specific national-based study since the year 1995. We performed a secondary analysis of the data from the AHS aimed at measuring rates of adherence to the Mediterranean diet in Australian adults and examining the association between levels of adherence and noncommunicable diseases, such as diabetes, hypertension and cardiovascular diseases. Trichoupoulou's score was calculated from two 24 h recalls. Results showed that out of the 9435 participants evaluated, 65% were in the middle tertile for MD adherence scores. Participants who were married, employed, of a high-socioeconomic level, nonsmokers, educated or had a healthy BMI and waist circumference were more likely to have higher adherence scores. In addition, the MD was associated with decreased levels of total cholesterol, LDL cholesterol, diastolic blood pressure and overall dyslipidaemia status. In synthesis, it would appear that adherence to the MD in Australia results in a protective role against CVD, possibly by improving serum lipid status and BP. To the best of our knowledge, these results are the first to assess adherence to the MD on a national level in Australia.

Effect of Two Healthy Diets on Vascular Endothelial Homeostasis in Patients with Coronary Heart Disease

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Aims: Endothelial dysfunction is a crucial step in the development of atherosclerosis, its severity being a key determinant for the risk of cardiovascular recurrence. Diet may be an effective strategy to maintain and protect the endothelium, although gaps also exist regarding the best dietary model. The present study analyzes the long-term consumption effect of two healthy diets on vascular endothelial homeostasis in coronary heart disease (CHD) patients and whether even those with endothelial dysfunction could be susceptible to the benefits of this therapeutic dietary strategy. **Methods:** Twenty-four patients from the CORDIOPREV study (NCT00924937), 12 patients with severe endothelial dysfunction (flow-mediated dilation (FMD) of the brachial artery 2%), and 12 patients with normal endothelial function (FMD > 4.5%) were randomized to follow, during one year, a Mediterranean diet (35% fat, 22% MUFA, and 50% carbohydrates) or a low-fat diet (28% fat, 12% MUFA, and >55% carbohydrates). We developed in vitro studies with two models of endothelial cells (HUVECs and endothelial progenitor cells, EPCs) that were incubated with the serum of these patients. We evaluated in vitro mechanisms related to endothelial damage (reactive oxygen species, apoptosis, and senescence) and endothelial repair mechanisms (cell proliferation and angiogenesis). **Results:** Mediterranean diet reduced reactive oxygen species levels in patients with severe endothelial dysfunction and increased cellular proliferation and angiogenesis in both groups of patients. The low-fat diet increased endothelial damage processes regardless of the severity of endothelial dysfunction. **Conclusion:** Mediterranean diet, but not a low-fat diet, could modulate endothelial function associated with a better balance of vascular homeostasis in CHD patients, even in those with severe endothelial dysfunction. This diet could be used as a therapeutic tool in the potential reduction of cardiovascular recurrence.

Lifestyle Modification in Patients with Non-Alcoholic Fatty Liver Disease: Results from an Italian Mediterranean-Oriented Intervention Study

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Background. NAFLD (Non-Alcoholic Fatty Liver Disease) is the most common liver disorder in Western countries; lifestyle intervention is supported by clinical evidence as the primary therapy for the management of NAFLD. **Methods.** We performed a single single-arm intervention study in patients with NAFLD. A cohort of subjects, selected from general practitioners, was addressed to the Department of Medicine to undergo (i) liver ultrasound (US), (ii) clinical and anthropometric evaluations, (iii) blood tests, and (iv) to assess dietary and physical activity habits, at baseline (T0) and after 12 months (T12). According to the results of US, subjects were classified in two groups: NAFLD patients (with severe, moderate or light steatosis) and healthy controls (no steatosis). Patients with NAFLD were instructed by experienced dieticians to improve their dietary pattern according to the Mediterranean style and to enhance their physical activity. Instructions were reviewed and reinforced at T3, T6, and T9. The main objective was the regression/remission of steatosis. The study was supported by Brescia University 2015 Health&Wealth call [ClinicalTrials.gov identifier number NCT0330061]. **Results.** A total of 58 patients, out of 73 enrolled, completed the study: 26 patients (45%) downgraded their steatosis severity, and among them, 12 completely recovered (21%). Main changes were as follows:

Parameter (n = 58)	T0 (mean ± SD)	T12 (mean ± SD)	p
Weight (Kg)	89.8 ± 19.3	87.2 ± 19.5	0.0001
BMI (Kg/m ²)	31.5 ± 0.7	30.5 ± 0.7	0.0001
WC (cm)	105 ± 2	104 ± 2	0.0793
Cholesterol (mg/dL)	207 ± 5	210 ± 5	0.2202
HDL-cholesterol (mg/dL)	50 ± 2	54 ± 2	0.0006
Triglycerides (mg/dL)	153 ± 14	127 ± 9	0.008
ALT (UL)	41 ± 3	39 ± 3	0.2195
AST (UL)	22 ± 2	22 ± 1	0.4252
Glucose (mg/dL)	98 ± 3	98 ± 3	0.5963

Neither regression nor remission of steatosis was statistically correlated to decrease in weight and WC. **Conclusions.** A Mediterranean-oriented lifestyle intervention was effective in achieving regression or remission of steatosis in almost half of the patients. The improvement was independent from changes in BMI or WC.

Red Wine as a Cardioprotective Agent: A Comparison between the Two Most Consumed D.O Wines in Spain

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Wine consumption has been shown to play a role in chronic disease prevention, especially due to its cardioprotective effects. This has been attributed to the complex net of antioxidants comprising mainly polyphenols, anthocyanins, and proanthocyanins (PAC). However, several factors in the winemaking process affect the content of antioxidants, thus influencing its health benefits. In this study, two popular Spanish wine Appellations of Origin were evaluated, Ribera del Duero and Rioja, to establish a comparison between its components and their potential cardioprotective role. Five Ribera del Duero and five Rioja Tempranillo wines from 2014 were collected for this study. Antioxidant capacity was evaluated with two methods, electrochemical (eBQC) and spectrophotometrical (DPPH). Polyphenols, PAC, and anthocyanins were measured. Finally, color density and hue were measured spectrophotometrically with the Sudraud method. Polyphenol and PAC concentration were directly correlated with the antioxidant capacity. Antioxidant capacity, polyphenols, and PAC were statistically higher in Ribera del Duero wines than in Riojas, while color density was found to be significantly higher for Riojas. The consumption of Spanish wines is led by Rioja followed by Ribera del Duero, with the former double in consumption compared to the latter. This preference is correlated with the higher color density, a good indicator of wine quality. However, the composition of Ribera del Duero wines is richer in phenolic bioactive compounds and so, it has a greater potential as a cardioprotective agent. Finally, it has been shown that for the determination of wine consumption benefits, the study of the antioxidants should be taken in account, given that they vary even within close geographical locations.

Abstracts

Session 5: Nutrients and Lifestyle Interactions

Dietary Patterns and Nutritional Adequacy and Lifestyle Factors among Medical Students of the University of Granada

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Introduction: Overweight, obesity, and inadequate diets lead the list of determinants which have a greater impact on the morbidity and mortality caused in our environment, especially for cardiovascular disease. Current evidence suggests that better health practices among health care professionals are associated with greater frequency and confidence of patient counseling regarding lifestyle and diet. **Objectives:** To study the diet quality of the medical students of Granada identifying nutrient intake adequacy and Mediterranean adherence (MD) and to identify lifestyle factors that could be associated to micronutrient intake compliance. **Methods:** A cross-sectional study of eating and exercise habits was carried out in 225 medical students from the University of Granada, Spain. Dietary intake was obtained through a semi-quantitative food frequency questionnaire (FFQ) and a 24-h dietary recall. Nutrient intake was calculated according to the most up-to-date food composition tables for Spain. Ideal cardiovascular health index (CVS), MD and other lifestyle variables were estimated from a specific questionnaire. Nutrient intake adequacy was calculated using the dietary reference intakes. Logistic regression models were used to estimate the association between lifestyle factors and nutrient intake adequacy. **Results:** We found an adequate energy intake (2078.6 ± 691.8 Kcal), but mainly from total fat (41%) and proteins (20%) with no gender differences. The prevalence of compliance with recommendations was lower than 50% for A and D vitamins and calcium intake. After energy adjustment, women had better compliance with recommendations for A vitamin than men. Lower compliance with micronutrients recommendations was found among sedentary and obese students and low punctuation for CVS and MD. **Conclusions:** The dietary pattern of medical students showed a low compliance with some micronutrients and low diet quality. Educative and behavioral interventions are necessary to improve the diet quality of medical students, who will perform patient counseling regarding lifestyle and diet in the future.

Food Consumption and Lifestyle in Melanesian Adolescents in the Global Transition of Pacific Countries

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Objectives: Even though tribal life is still present in the Melanesian community, the socioeconomic transition occurring in the Pacific region leads to changes in food consumption and lifestyle, leading to obesity and chronic diseases. The aim of this study was to understand food consumption and associated lifestyle parameters of Melanesian adolescents living in both urban and tribal areas of New Caledonia. **Methods:** A total of 428 Melanesian adolescents (11–16 years old) participated in this study. A food frequency questionnaire, duration of sleep, and body composition were analyzed. **Results:** Food consumption showed a balanced consumption of vegetables (21.5 ± 11.1 and 22.1 ± 10.9 units.week⁻¹ in R and U, respectively) regardless of place of living and a low fruit consumption regardless of place of living (18.7 ± 8.5 and 18.4 ± 8.3 units.week⁻¹ in R and U, respectively). On the other hand, a high consumption of fats and oils (11.2 ± 12.4 and 11.5 ± 13.1 units.week⁻¹ in R and U, respectively); meat, fish, poultry, and eggs (14.3 ± 8.5 and 14.9 ± 8.8 units.week⁻¹ in R and U, respectively); and sweet sugar beverages (8.1 ± 8.5 and 9.2 ± 9.6 units.week⁻¹ in R and U, respectively) were also noted regardless of place of living. Sleep duration during school nights was reduced in rural areas. **Conclusions:** For the first time, data about food consumption and lifestyle of tribal and urban Melanesian adolescents of New Caledonia were gathered. While traditional food, which includes daily consumption of fruit and vegetables, is still part of tribal adolescents' diet, a dramatic consumption of SSB, oils and fats is also present, along with a low sleep duration. Thus, traditional food, processed food, and lifestyle need to be understood to fight against obesity and chronic diseases, which are a major issue in the Pacific.

Determinants of Iron Status in Pregnant Women. ECLIPSES Study

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Background: An unbalanced iron status, whether due to iron deficiency (ID), anemia, iron deficiency anemia (IDA) or iron excess (hemoconcentration (Hc)) has detrimental effects on maternal–fetal health. We aimed to evaluate the effectiveness of different doses of iron supplements adjusted for initial hemoglobin (Hb) levels on maternal iron status and to describe the associated prenatal factors. **Material and Methods:** A total of 791 participants from the ECLIPSES study were randomly allocated into two groups, according to their initial Hb levels: *stratum 1* (Hb = 110–130 g/L, received 40 or 80 mg/d iron) and *stratum 2* (Hb > 130 g/L, received 20 or 40 mg/d iron). Data from clinical history, biochemical determinations, HFE genotype, ethnic origin, diet, supplementation, lifestyle, and sociodemographic characteristics were recorded throughout gestation. Statistical analyses were performed using the SPSS software. **Results:** In *stratum 1*, 44.7% showed ID, 12.4% anemia, 9% IDA, and 7.3% Hc at the third trimester, while in *stratum 2*, the percentages were 67.7%, 10%, 9.4%, and 19.4%, respectively. In *stratum 1*, the use of 40 mg/d instead of 80 mg/d doubled the risk of ID, while the increasing initial levels of serum ferritin (SF) protected against ID, anemia, and IDA. In *stratum 2*, initial SF and middle–high socioeconomic status protected against anemia and IDA. The lower dose of iron reduced the risk of Hc ($p = 0.033$), while the H63D mutation of HFE gene increased it ($p = 0.030$). **Conclusions:** High doses of iron increase iron stores without differences on risk of anemia and IDA at the third trimester, when initial Hb levels are 110–130 g/L, while low doses reduce the risk of Hc without increasing ID or anemia, when they are >130 g/L. Maternal iron status early in pregnancy has a great influence on it in the last months; therefore, having early data of Hb, SF, and HFE mutations could help to prescribe the appropriate doses of iron supplements.

Determination of the Effect of Maternal Iodine Status on Newborns

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Iodine deficiency disorders (IDD) are an important public health problem in many countries with negative consequences, especially in pregnant and lactating women and children. The aim of this study was to determine the iodine status of pregnant women and newborns. This research was based on a descriptive, cross-sectional study, conducted on 60 pregnant women and newborns. Demographic characteristics and anthropometric measurements were assessed, spot urine samples were collected, and urinary iodine excretions were determined. Mean (\pm SD) age of women was 26.5 ± 4.8 years. Out of the total, 73.3% of pregnant women were consuming iodized salt. Maternal mean urinary iodine concentration (UIC) was 163.4 ± 79.6 mcg/L (iodized salt consuming women (ISCW): 192.9 ± 71.1 ; and noniodized salt consuming women (NISCW): 82.3 ± 29.8 mcg/L, $p = 0.000$, $p < 0.05$). Mean UIC of the newborns was 113.5 ± 44.9 mcg/L (newborns of ISCW: 129.3 ± 41.4 and newborns of NISCW: 70.2 ± 16.6 mcg/L; $p = 0.000$, $p < 0.05$). It was found that 3.3% of pregnant women had severe iodine deficiency (50 mcg/L), 16.7% had moderate deficiency (50 – 99 mcg/L), 21.7% had mild deficiency (100 – 149 mcg/L), 50.0% had adequate levels of iodine (150 – 249 mcg/L), and 8.3% excessive iodine (250 – 499 mcg/L). In the newborn, deficiency, adequacy, and excess levels were found to be 33.3%, 63.3%, and 3.3%, respectively. Mean body weight of the newborns of the pregnant women with severe urinary iodine excretion was 2200.0 ± 282.8 grams, while it was 3308.0 ± 384.8 and 3450.0 ± 70.7 grams for the infants of pregnant women with adequate and excessive urinary iodine excretion ($p = 0.005$, $p < 0.05$, respectively). Height, head circumference, and body mass index (BMI) of newborns of ISCW were higher than those of NISCW ($p = 0.000$, $p = 0.001$, $p = 0.04$, $p < 0.05$). National programs for the prevention of IDD should be implemented and monitored effectively.

Abstracts

Session 6: Nutrition for Ageing Populations

Making Old Brains Young Again: The Benefits of Resveratrol on Cerebrovascular Function and Cognition

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Ageing and microvascular dysfunction can lead to impairment of cerebrovascular function, resulting in reduced perfusion, which may accelerate cognitive decline. We have previously reviewed the implications of impaired working memory on everyday functioning for type-2 diabetes adults; namely the importance of working memory for self-management behaviours of their disease in this population. We have built a body of evidence that resveratrol, a phytoestrogen present in grapes and berries, can improve cerebrovascular function and cognitive performance in populations at-risk of dementia, viz. postmenopausal women and adults with diabetes, offering a potential novel approach to assist with healthy ageing. Our group determined the dose-response relationship of four doses of resveratrol (0, 75, 150 and 300 mg) on cerebrovascular responsiveness and cognitive function in adults with type-2 diabetes. This was preceded by a 14-week evaluation of a modest dose resveratrol supplementation in women after menopause, as they are at heightened risk for dementia. Compared to placebo, resveratrol supplementation (2 × 75 mg/day) augmented cerebrovascular responsiveness that was accompanied by improvement in cognitive performance and boosting of overall well-being. In this paper, we present the findings of the RESHAW (Resveratrol Supporting Healthy Ageing In Women) study, which is the largest (140 participants) and longest (2 years) randomised crossover trial of resveratrol supplementation undertaken in postmenopausal women. It is designed to confirm our earlier evidence of cerebrovascular and cognitive benefits of low dose resveratrol supplementation in this population.

The Favorable Impact of Dietary Fibre Intake on Body Composition in Older Adults Is Independent of Physical Activity Habits

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Fibre-rich diets have the potential to readily influence age-related changes in body composition, including loss of muscle mass and increased fat mass, which together lead to adverse effects on physical function. However, a paucity of data is available about the impact of dietary fibres specifically in the older population. Therefore, we aimed to determine the specific impact of dietary fibre intake on muscle mass and fat mass in a large cohort of European older adults, while considering other dietary qualities and physical activity (PA) habits. **METHODS:** A total of 1009 European older adults (mean age 71 ± 4 years, 57.3% female) were recruited from five European study centres. Dietary intake including fibre intake was assessed using food records. Body composition (skeletal muscle mass index (SMI), total and central fat mass) was assessed using dual-energy X-ray absorptiometry. Generalized linear models stratified by sex were used to examine effects on body composition outcomes across tertiles of fibre intake adjusted by total energy intake, protein intake, adherence to healthy diet, and PA guidelines. **RESULTS:** In both sexes, a higher fibre intake was significantly ($p < 0.05$) linked to higher SMI, lower total fat mass and central fat mass, regardless of other dietary variables. Importantly, the favourable impact of fibres remained even after accounting for adherence to PA guidelines. In addition, a higher fibre intake was significantly ($p < 0.05$) associated with a lower fat-to-muscle mass ratio (Central fat/SMI). **CONCLUSION:** This study suggests a favourable fibre-specific effect on major determinants of body composition in older adults that is independent of other dietary habits and health-enhancing PA. This implies that simply meeting guidelines for fibre intake can mitigate age-related decline in muscle mass and accumulation of adipose tissue.

Vitamins B6, Folates, and B12 Intake and Risk for Frailty among Community-Dwellers from the Three-City-Bordeaux Cohort

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Introduction. As a modifiable factor, nutrition could be considered as a relevant preventive strategy for frailty. Several associations have been suggested between nutrients (proteins, and vitamins D and E, for instance) and a lower risk for frailty. A single Spanish study so far has investigated the relationship between dietary vitamins B (B6, folates or B12) and the 5-y risk of frailty. The aim of the present study was to test this association among French older adults. **Methods.** The sample was constituted of 1028 nonfrail older adults (73.2 years old on average) enrolled in the Bordeaux-Three-City cohort, and re-examined for frailty up to 15 y later. The frailty was assessed by the Fried criteria (3 out of 5 among weakness, slowness, low energy expenditure, unintentional weight loss, and chronic fatigue). Dietary intakes of vitamins B (B6, folates and B12) were recorded at baseline using a 24-h dietary recall. The associations between the dietary consumption of vitamins B on risk for frailty were adjusted for age, sex, educational level, smoking, comorbidities, polypharmacy, and energy intake. **Results.** The studied sample mainly constituted of women (66%). Over a mean duration of 14.4 y, frailty was identified among 425 participants. The lowest dietary intake of vitamins B6 and B12 was not associated with the risk for frailty over time. Regarding folates intake, the lowest consumption (less than 210 µg/d) was associated with a higher risk for frailty (HR = 1.44; IC95% 1.11–1.87) compared with a higher consumption (over 313 µg/d). This result was virtually unchanged after adjustment for B6 and B12 intakes (HR = 1.54, IC95% 1.17–2.04, P-global = 0.008). **Conclusion.** A lowest dietary folate intake, whatever the vitamins B6 and B12 intakes, was associated with a 44% higher risk for frailty among French older community-dwellers over time. Older adults with the lowest folate intakes should be considered as a relevant target for frailty prevention.

Abstracts

Session 7: Polyphenols and Antioxidants

The Naturally Occurring Antioxidant Lipoic Acid Modulates Monocyte and Macrophage Function in Multiple Sclerosis

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Activation of peripheral monocytes and CNS macrophage-related cells is important in the pathogenesis of multiple sclerosis (MS). Macrophages respond to CNS chemokines, produce mediators that promote demyelination, are involved in degradation of myelin sheathes, and contribute to lesion formation. Supplementation with the antioxidant lipoic acid (LA) reduces disease severity in a murine model of MS. Administration in MS subjects reduces brain atrophy compared to placebo. To advance LA into clinical use, its mechanism of action must be elucidated. We have shown that LA has immunomodulatory effects, including inhibition of monocyte migration. LA also activates the nuclear factor erythroid 2-related factor 2 (Nrf2) pathway. We hypothesize that LA has direct effects on peripheral monocytes and downstream effects on CNS resident and infiltrating macrophages via Nrf2 signaling. We cultured human monocytes and monocyte-derived macrophages (MDM) to polarize toward an MS-like phenotype, in the presence and absence of LA. We subsequently used ELISAs to measure production of IL-6, IL-1 β , and TNF- α , cytokines that are present at elevated levels in active MS lesions, as well as inflammatory and Nrf2-associated biomolecules (COX-2, prostaglandins, and heme-oxygenase 1 (HO-1)). Pre-treatment with LA blocked (LPS/IFN- γ polarized) production of TNF- α and IL-6 in both monocytes and MDM, and IL-1 β in monocytes. Inhibition was more robust in MDM. The effects of LA on COX-2 and prostaglandins were more nuanced, with stimulation of COX-2, PGE₂, and PGI production at low LA concentration in monocytes. Conversely, LA blocked prostaglandin production in polarized MDM. LA treatment increased HO-1 in both monocytes and MDM in cells that were not polarized. Finally, in phagocytosis assays, LA reduced the percentage of phagocytic monocytes and MDM. Collectively, these data show that LA alters Nrf2-associated signaling and may provide protection against MS by differential modulation of monocyte and macrophage function.

Dietary Inflammatory Index, Dietary Non-Enzymatic Antioxidant Capacity, and Colorectal and Breast Cancer Risk (MCC-Spain Study)

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Introduction: Colorectal cancer is the third most common cancer worldwide in both sexes. Among females, breast cancer and colorectal cancer are the two most frequently diagnosed cancers and the two most common causes of cancer-related mortality in developed countries. Inflammation and anti-oxidant capacity have been associated with both tumor locations. **Objective:** We estimated the dietary inflammatory index (DII®) and the total dietary non-enzymatic antioxidant capacity (NEAC) and associated them with colorectal and breast cancer risk in the population-based multicase-control study in Spain (MCC-Spain). **Methods:** We included 1852 colorectal cancer and 1567 breast cancer cases, and 3447 and 1486 population controls, respectively. DII® score and NEAC were derived using data from a semiquantitative validated food frequency questionnaire. The energy-adjusted DII® (E-DII) was analyzed as a continuous and as a categorical variable, expressed as quartiles based on the sex-specific distribution in the control group. Unconditional logistic regression models were used to estimate odds ratios (OR) and 95% confidence intervals (95%CI) for E-DII, and a score combining E-DII and NEAC. **Results:** E-DII was associated with colorectal cancer risk (OR_{Q4vsQ1} = 1.93, 95%CI: 1.60–2.32; *p*-trend < 0.001); this increase was observed for both colon and rectal cancer. Less pronounced increased risks were observed for breast cancer (OR_{Q4vsQ1} = 1.22, 95%CI: 0.99–1.52, *p*-trend > 0.10). The combined score of high E-DII scores and low antioxidant values was associated with colorectal cancer risk (OR_{Q4vsQ1} = 1.48, 95%CI: 1.26–1.74; *p*-trend < 0.001), but not with breast cancer. **Conclusions:** This study provides evidence on the association between colorectal cancer risk and the inflammatory potential of the diet, as well as the combination effect between the inflammatory potential of the diet and the total dietary antioxidant capacity. Findings for breast cancer were less consistent.

Lanosteryl Triterpene from *Protorhus longifolia* Prevent Diabetes-Induced Cardiomyopathy in H9c2 Cells

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Cardiovascular disease is a known risk factor for the development of diabetic cardiomyopathy. Currently, researchers are looking into natural products as adjunctive therapies to use with the current treatment regimen against diabetes and concomitant cardiovascular complications. Herbalists in South Africa have been using *Protorhus longifolia* as a blood-thinning agent, and recently, they demonstrated that RA3 derived from the stem barks of *P. longifolia* can act as a nutraceutical to control hyperglycemia. However, the effect of RA3 on protecting the diabetic myocardium has not been investigated. In this study, we aimed to assess the mechanism by which RA3 can improve glucose uptake, whilst decreasing lipotoxicity, oxidative stress, insulin resistance, and apoptosis in H9c2 cardiomyoblasts exposed to high glucose. H9c2 cardiomyoblasts were cultured in either normal (NG—5.5 mM) or high (HG—33 mM) glucose for 24 h. Subsequently, cells exposed to HG were treated with RA3 (1 μ M), n-acetyl cysteine (NAC, 1 mM), metformin (MET, 1 μ M), a combination of MET+RA3, as well as MET+NAC for a further 24 h. Data from this study accentuated the antidiabetic properties of RA3 through its ability to improve shift in substrate preference and insulin signaling in the H9c2 cardiomyoblasts. We further demonstrated the capability of RA3 to mitigate high glucose-induced oxidative stress, lipid peroxidation, mitochondrial depolarization, and apoptosis in these cells. We proposed that RA3 can protect the diabetic myocardium by decreasing increased NF- κ B/PKC/IRS-1^{Ser307} mediated inhibition of GLUT4 expression in H9c2 cardiomyoblasts. Interestingly, the results from this study showed a synergistic cardioprotective effect with the treatment of MET+RA3. However, the combination of MET+NAC was not as effective as MET alone. Taken together, the data presented in this study provide a credible mechanism by which the combination treatment of MET+RA3 could protect the diabetic heart from developing cardiomyopathy.

Date Seeds as a Promising Future Functional Ingredient: Results from the In Vitro Study of Bioaccessibility of Date Seed Polyphenols

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Date (*Phoenix dactylifera* L.) fruit is a vital agriculture crop in the Middle East. The seeds of the plant, a rich source of polyphenols, are a by-product of the date processing industry, which hardly find any human use. However, the detailed polyphenolic composition is unknown. In addition, even if diverse health effects, including an antioxidant action, were associated with date seeds extract (DSE), the ability of native DSE polyphenols to cross the intestinal barrier (bioaccessibility) and reach the target tissues to exert their biological actions remains to be determined. The purpose of this work was to characterize the polyphenolic content in Khalas variety DSE and to study its bioaccessibility. HPLC-ESI-UV/MS/MS(IT) was used to identify the polyphenols in DSE. The bioaccessibility of polyphenol was studied by performing in vitro digestion coupled with Caco-2 cells monolayer as an in vitro model for intestinal absorption. We detected flavan-3-ols, phenolic acids, flavones, and flavonols in DSE. Flavan-3-ols were the most abundant, with a mean degree of polymerization of 10.15, indicating the presence of highly polymeric proanthocyanidins. In vitro digestion of DSE resulted in the recovery of phenolic acids, such as protocatechuic acid, p-hydroxybenzoic acid, and caffeoyl shikimic acid, which was transported across Caco-2 monolayer. Procyanidin B2 was also detected. However, it was not transported across the cell monolayer. Our results indicate that DSE is rich in polyphenols, especially highly polymeric flavan-3-ols. Phenolic acids were recovered following in vitro digestion and quickly absorbed through the Caco-2 monolayer. No trimers or tetramers of procyanidins were detected following in vitro digestion, and we suspect their ability to form protein and polysaccharide complexes as the reason for nondetection. However, a contribution can be expected from the significant non-absorbed portion of DSE polyphenols through its interaction with gut microbiota, generating active metabolites in the colon.

Antioxidant and Anti-Inflammatory Activity of Cherry Extract Encapsulated in Nanoparticles on Endothelial Cells

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Oxidative stress and inflammation play an important role in endothelial dysfunction involved in the pathogenesis of several chronic diseases, including cardiovascular diseases. Among agrifood products, cherries are rich in antioxidants and biologically active substances, such as polyphenols and anthocyanins. Our aim was to evaluate the antioxidant and anti-inflammatory effects of natural cherry extract (CE) polyphenols on human umbilical vein endothelial cells (HUVECs), both free and encapsulated in chitosan-derivatives (Ch-der) mucoadhesive nanoparticles (QA-Ch-NPs: NP1; QA-Ch-S-pro-NPs: NP2) or PLGA NPs. CE from *Prunus Avium* L. was characterized for total phenolic content and antioxidant power, using the Folin–Ciocalteu and FRAP assay methods, respectively. CE and CE-loaded NPs cytotoxicity and protective effect on H₂O₂-stressed HUVECs were assayed by WST-1. ROS production was evaluated using a fluorescent probe. Pro- and anti-inflammatory cytokines (TNF- α , IL-6, IL-10, and COX-2-dependent prostaglandin E₂ (PGE₂)) secretion in LPS-stressed HUVECs was quantified by ELISA. CE added to HUVECs induced a reduction in oxidative stress and ROS production at higher polyphenols concentrations (5 and 10 μ g gallic acid equivalent (GAE)/mL), and such effects were maintained with CE-loaded PLGA NPs. Ch-der NPs significantly enhanced low polyphenolic concentration (2 μ g GAE/mL) antioxidant effect. Moreover, loaded Ch-der NPs improved the anti-inflammatory effect of CE 2 μ g GAE/mL. In particular, loaded-NP1 blunted secretion of IL-6, TNF- α , and PGE₂, and increased secretion of anti-inflammatory IL-10. These results demonstrate that natural cherry extract protects endothelial cells from oxidative and inflammatory stress and that Ch-der NPs and PLGA NPs reduce polyphenols degradation and improve their positive effects.

Phenolic Compounds from Coffee Regulate Isoprostanes and Prostaglandins: An In Vivo and In Vitro Approach

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The consumption of coffee is associated with the regulation of particular F_{2t}-isoprostanes and prostaglandins, considering biomarkers related to cardiovascular diseases (CVDs). Isoprostanes and prostaglandins, known as oxylipins, are generated in vivo via oxygenation of polyunsaturated fatty acids as a result of oxidative stress and inflammation. Oxylipins are also produced during the foam cell formation in atherogenesis. Taking into account the anti-inflammatory and antioxidant properties of the chlorogenic acids (CGAs), we evaluated the effect of two types of coffees on selected urinary oxylipins in healthy subjects by UHPLC-QqQ-MS/MS analysis. The volunteers' mean age was 38.5 ± 9 years and body mass index 24.1 ± 2.6 kg/m², and 38 were men and 37 women. Additionally, we assessed the effect of CGAs and other phenolic compounds (PC) against the cellular proatherogenic response in foam cells using an oxLDL-macrophage interaction model. After eight weeks of coffee consumption, several urine oxylipins were reduced. However, one coffee was stronger in reducing this biomarker, probably due to its higher content of CGAs. On the other hand, the oxylipin induction by oxLDL on foam cells in vitro was ameliorated by PC and CGAs. Related to the inhibition of atherogenic markers in macrophages stimulated with oxLDL, a significant reduction in the uptake of oxLDL was observed for some of the PC evaluated (4-CQA ($P < 0.001$), 3-CQA, DFHA and CoA ($P < 0.01$)). Related to CD36, SR-A, and LOX-1, responsible for approximately 90% of oxLDL uptake by macrophage, a significant reduction was observed for DHFA and diCQAs treatments. This study provides clinical and in vitro evidence about the effect of CGAs and PC from coffee-regulating oxylipins, well-accepted biomarkers of oxidative stress and inflammation in CVD. (Ethics Committee CES University: Act 47; project 142. May 16th 2012; WHO primary registry requested in the Cuban Public Registry of Clinical Trials RPCEC00000168).

Abstracts

Session 8: Dietary Assessment

Development and Validation of a Self-Administered Italian Semi-Quantitative Food Frequency Questionnaire to Estimate Nutrient Intake

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Background. Food Frequency Questionnaires (FFQs) are valuable research tools in nutritional epidemiology. The aim of this study was to develop and validate a new semi-quantitative FFQ, specifically designed for the Italian population. The new FFQ was developed for self-administration, in order to allow extensive use among Italians through a web-based application service.

Methods. During the development process, we adapted the validated FFQ by the Fred Hutchinson Cancer Research Center to Italian needs, revising food items, food frequency scale, portion sizes, and time frame. To assess the validity of the new FFQ, we compared the estimated daily intake using FFQ with the mean of 3-day food diaries and one 24-h recall (considered as the reference method, RM). The following statistical analyses were applied: Spearman correlation coefficient, to measure strength and direction of the association between RM and FFQ; cross-classification according to tertiles distribution; weighted Cohen's kappa, to assess agreement beyond chance; Bland–Altman analysis, to detect the presence, direction, and extent of bias and the level of agreement at a group level. **Results.** The validation process was conducted among a cohort of 51 healthy subjects, enrolled in a clinical trial (approved by the local Institutional Ethics Committee and registered at www.clinicaltrials.gov NCT0330061). The statistical tests were applied on 23 estimated nutrient intakes. Spearman's coefficients ranged from 0.223 (sodium) to 0.748 (alcohol) and were good (≥ 0.50) and acceptable (0.20–0.49) for 7 and 16 nutrients, respectively. Cross-classification showed a good agreement ($\geq 50\%$ in the same tertile or $\leq 10\%$ in the opposite tertile) for 7 nutrients. The weighted Cohen's kappa values indicated an acceptable outcome (0.20–0.60) for 13 nutrients. Bland Altman plots did not show heteroscedasticity in the error terms. **Conclusions.** Our study provided a new Italian semi-quantitative FFQ for self-administration, suitable for epidemiological studies.

Dietary Patterns, Nutritional Components, and Obesity among Mexican Schoolchildren

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Introduction: Changes in nutritional status worldwide have been associated with specific dietary patterns (DPs), particularly in developing countries. Obesity–overweight prevalence in schoolchildren in México is 33.2%, and consumption of not recommended food is high. Objective: To evaluate the association between DP and diet components with nutritional status in Mexican schoolchildren. **Method/design:** Longitudinal study of 386 schoolchildren aged 6–12 years old. Anthropometric variables were used to calculate body mass index; dietetic data were obtained from at least one 3-day dietary recall for twelve months. DPs were identified using principal components analysis followed by orthogonal varimax rotation. Carbohydrates, proteins, lipids, fiber, vitamins A, B12, C, D, calcium, phosphorus, iron, potassium, sodium, and zinc were compared by DP. ANOVA, *t*-test, and Wilcoxon-rank tests were used to evaluate differences in continuous variables, and Chi-squared tests were used for categorical variables. **Results:** With 240 different foods, three DPs that explain 53% of the variance were identified: DP-1: high consumption of cereals, tubers, legumes and vegetables; DP-2: high consumption of dairy products and fruits; DP-3: high consumption of fats and animal products. DP-1 provides higher amounts of carbohydrates, protein, fiber, iron, and zinc, while DP-2 calcium, phosphorus, potassium, sodium, zinc, vitamins A, B12, C, and D. DP-3 was higher in cholesterol and saturated fatty-acids ($p < 0.05$). Highest prevalence of obesity–overweight was in children in DP-3 (54%) and lowest in DP-1, although only 124 (32%) children were identified in DP-1. **Conclusions:** These three DPs explain a reasonable amount of the variation in the nutrients of habitual diet. Even though higher consumption of recommended dietetic components is related to a better nutrition status, most of the children eat an unhealthy diet.

Association of Dietary Patterns with Heart Rate Variability: Results from a Cross-Ectional Study

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Assessment of heart rate variability (HRV), premature ventricular and atrial complexes (PVC and PAC) is a clinically relevant topic, since they might be predictors of severe, life-threatening cardiac arrhythmias. There is a growing body of literature regarding the central role of some nutrients, lifestyle habits, and body composition in affecting the risk of cardiac arrhythmias, especially ventricular ones, but little evidence is available regarding PVC, PAC, and HRV. The present study aimed to inspect relationships of lifestyle, dietary patterns, and anthropometrics with HRV, PVC, and PAC. A cross-sectional study enrolling subjects undergoing Holter monitor in an Italian cardiac rhythm lab was done. Sociodemographic and clinical characteristics, body composition (full-body bioimpedentiometry), and dietary patterns (24-h dietary recall) were recorded. Generalized additive models were estimated to assess the relationships between outcomes of interest and variables collected. One hundred and twenty-one consecutive patients attending the cardiac rhythm lab for 24-h Holter monitor were enrolled in the study. Ninety-five patients out of 121 had at least one PVC (reported by 24-h Holter monitor), with a median of 78 PVC (13-746, I-III quartiles). At multivariable analysis, fruit consumption was found to be directly associated with HRV (p -value 0.044), while higher BMI resulted in being associated with lower HRV (p -value 0.083, barely significant). Regarding PVC, results showed that it was significantly directly associated with age (p -value 0.005), higher intake of the grain-based product (p -value 0.001), and consumption of snacks and sugars (p -value 0.063 and 0.013, respectively), whereas fruit intake was found to be significantly inversely associated with PVC (p -value 0.024). Present findings might be useful to improve the management of patients attending cardiac rhythm labs, to tailor ad hoc prevention strategies (modification of lifestyle and eating habits) based on Holter parameters.

Sodium Consumption in 'Nova' Dietary Patterns of Mexican Schoolchildren and Nutritional Status

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Consumption of ultra-processed products has been associated with a higher consumption of sodium and an increase in body mass index (BMI). In 2016, the prevalence of overweight and obesity in Mexican schoolchildren was 33.2%.

The objective of the present study was to relate the consumption of sodium with dietary patterns based on the NOVA classification, in schoolchildren in the center of Mexico. **Methods:** A total of 790 school children aged from 6 to 11 years were evaluated, getting BMI for each one. A total of 386 completed at least one three-day-diet record. Four dietary patterns were obtained, using factorial analysis and principal component analysis with VARIMAX rotation, according to NOVA classification (Pattern 1 ultra-processed, pattern 2 processed culinary ingredients, pattern 3 processed meals, and pattern 4 unprocessed). Children in each dietary patterns were identified, and sodium consumption averages were compared by DP using Student's *t*-test ($p \leq 0.05$). Of the 386 schoolchildren, 133 (34.45%) were placed in DP-1, 33 (8.55%) in DP-2, 109 (28.24%) in DP-3, and 111 (28.76%) in DP-4. Mean sodium consumption in DP-1 was 2981.03 ± 535.72 mg/day, higher than in the rest of the DPs; however, it was not statistically significant ($p \geq 0.05$). This sodium consumption exceeded WHO recommendations in the four DP. Prevalence of overweight-obesity was higher in DP-1. **Conclusion:** In this population, the consumption of ultra-processed foods is defining dietary patterns in school-age children. Although both sodium consumption and the prevalence of overweight-obesity are high in these patterns, despite not having significant differences between patterns and that in all cases, sodium consumption exceeds the WHO recommended, it is relevant to do screening studies at school age to prevent chronic diseases in early adulthood.

Exploring the Perceptions of Women from Under-Resourced South African Communities about Participating in a Nutrition Education Program: A Qualitative Focus Group Study

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Scientific evidence suggests that low-carbohydrate high-fat (LCHF) diets may be effective for managing noncommunicable diseases (NCDs). Eat Better South Africa (EBSA) is an organization which has run LCHF nutrition education programs for women from low-income mixed-race communities. This study is part of a larger project to evaluate if the EBSA program improves participants' health. Three focus group discussions (FGDs) were held with 18 women who had taken part in an EBSA program between 2015 and 2017, to explore their perceptions and to identify the facilitators and barriers they faced to implement and sustain dietary changes. Thematic analysis of the focus groups was conducted using NVivo 12 software. Women reported that they decided to enroll in the program because they suffered from NCDs and believed the program would improve these conditions. Most women said that the diet made them feel less hungry, more energetic, and felt that their health had improved. Although most of the women reported that they remembered what they had learned about nutrition, they spoke of numerous socioeconomic challenges which made it difficult for them to follow EBSA's recommendations. These challenges included work status, safety issues in the community, and lack of support from relatives and doctors. Hence, women felt they needed more support from EBSA after the program. Some of the social determinants that affected these women's ability to change their health behavior are also NCD risk factors, and these should be assessed if the program is to be improved for other communities.

Inflammatory Dietary Patterns Derived by Reduced Rank Regression in Adults—Partial Results from a Systematic Review

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Background: Reduced rank regression (RRR) is a hypothesis-driven empirical method for the derivation of a posteriori dietary patterns. It takes into consideration not only the population-specific correlation between food group intakes but also the association of the dietary pattern with intermediate biomarkers of disease. Since low-grade systemic inflammation is an intermediate condition for a myriad noncommunicable diseases, the RRR approach can be applied to derive inflammatory dietary patterns and reveal dietetic strategies to prevent these diseases. **Objective:** To compare the dietary patterns derived by the RRR approach in distinct populations to highlight the similarities and differences between the so-called “inflammatory diets”. **Methods:** Systematic review in four electronic databases (MEDLINE, LILACS, EMBASE, and Web of Science) from database inception to October 2018. The search strategy used the following sets of descriptors: adults; dietary pattern; inflammatory blood biomarkers; and observational studies. Potentially eligible articles were selected independently by two reviewers. Four studies meeting the inclusion criteria and using RRR as the main method to derive dietary patterns were included. The main reason for study exclusion was sample age range different from 19–65 years ($n = 72/99$). Despite the inflammatory dietary patterns derivation in populations from three different locations (Germany, United Kingdom, and United States of America), they had a similar composition concerning higher intake of caloric and diet soft drinks, refined grains, processed meat, and red meat, and lower intake of fruits and vegetables. Other food groups varied across locations and cultural habits. **Conclusion:** Although inflammatory diets in adults have different compositions according to study location and culture, all of them were associated with inflammatory blood biomarkers (C-reactive protein, $n = 3$; adiponectin, $n = 2$; interleukin-6, $n = 2$), and had common points between them, such as high intake of soft drinks, refined grains, processed meat, and red meat, and low intake of fruits and vegetables.

Abstracts

Poster Exhibition

1. α_1 -Acid Glycoprotein and Dietary Intake in End-Stage Renal Disease Patients

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Management of end-stage renal disease (ESRD) patients requires monitoring each of the malnutrition–inflammation–atherosclerosis syndrome components. A restrictive diet can negatively affect nutritional status and inflammation. One of acute phase proteins, α_1 -acid glycoprotein (AGP), has well-documented immunomodulatory properties: it inhibits proliferation of lymphocytes and downregulates migration of neutrophils. The aim of the study was to look for the relationship among AGP level, laboratory parameters, and nutrient intake in ESRD patients. The study included 60 patients treated with maintenance hemodialysis. A 24-h recall assessed dietary intake during two nonconsecutive days. Selected parameters were assessed: complete blood count, serum vitamin D, AGP, C-reactive protein (CRP), albumin, prealbumin, as well as procalcitonin (PCT) and phosphate–calcium metabolism markers (iPTH, calcium, phosphate). Recorded dietary intake was highly deficient. Over 90% of patients did not meet recommended daily requirements for energy, protein, fiber, magnesium, and vitamin D. AGP correlated statistically positively with platelets ($R = 0.4$), PCT ($R = 0.4$), and CRP ($R = 0.5$) and negatively with MCHC—mean corpuscular hemoglobin concentration ($R = -0.32$), MPV—mean platelet volume ($R = -0.36$), P-LCR—platelet large cell ratio ($R = -0.35$), and PDW—platelet distribution width ($R = -0.33$). AGP correlated negatively with intake of protein ($R = -0.40$), fiber ($R = -0.4$), zinc ($R = -0.38$), potassium ($R = -0.44$), phosphorus ($R = -0.39$), magnesium ($R = -0.42$), iron ($R = -0.45$), copper ($R = -0.43$), manganese ($R = -0.35$), vitamin A ($R = -0.3$), β -carotene ($R = -0.30$), vitamin E ($R = -0.33$), vitamin B₂ ($R = -0.32$), vitamin B₆ ($R = -0.37$), and folates ($R = -0.4$), $p < 0.05$. Higher intake of protein, fiber, zinc, potassium, phosphorus, magnesium, iron, copper, manganese, β -carotene, vitamin A, E, B₂, B₆, and folates in ESRD patients is associated with lower AGP level. Hemodialysis patients must restrict potassium and phosphorus supply; however, ensuring adequate intake of other nutrients could improve their nutritional status and immune function.

2. Development of a Qualitative Dietary Protocol and an Evaluation of Its Application in Dietary Counseling on the Example of Hashimoto Thyroiditis: Study Design, Protocol, and Methodology

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The current state of knowledge about dietary recommendations in Hashimoto thyroiditis (HT) is far from satisfactory. The objective of the study was to systematize knowledge related to dietary recommendations in HT and to develop a qualitative dietary protocol (QDP) as a simple tool in dietary counselling. To identify studies reporting hypothyroidism and HT subjects, we searched the PUBMED, EMBASE, and COCHRANE LIBRARY databases (to March 2018) and the bibliographies of key articles. Based on the data extracted, dietary recommendations in HT were established, and the QDP was developed as a graphic-text tool to help patients to exercise self-control in food consumption. The QDP contains two lists of foods recommended and not/less recommended for HT subjects with indicated consumption frequency per day/week/month. The study was designed as a dietary intervention lasting 6 months in two parallel groups: experimental and control. In the experimental group, the QDP was applied, while in the control group, a classical dietary counselling (with discussion of recommendations and menu suggestions), both based on the same dietary recommendations in HT. In total, the study will include 80 women with diagnosed HT. The patients will be randomly divided into the experimental/control group (40/40). Data related to diet, lifestyle, nutrition knowledge, quality of life, thyroid function, blood pressure, body composition, and serum concentration of fasting glucose and lipids profile at baseline and after a 6-month follow-up will be collected. This study will contribute to providing valuable data that are useful both to dietitians and physicians. We anticipate that this graphic-text QDP can improve drug treatment, reduce the co-occurrence of other metabolic disorders, and improve the quality of life of HT subjects.

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3. Prenatal Exposure of Extra Vitamin D from Fortification and Later Risk of Inflammatory Bowel Disease: The D-Tect Study

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Introduction: Inflammatory bowel disease (IBD) is a chronic immune-mediated inflammatory disease that can affect the entire digestive tract. Approximately 1% of the Danish population has IBD today. Both the incidence and prevalence of IBD are increasing globally, but the etiology of IBD is still not fully understood. Some studies find that vitamin D has both protective and therapeutic effects on IBD. To our knowledge, no other study has investigated prenatal exposure to extra vitamin D from fortification, diet or supplements in relation to IBD. The aim of this study was to investigate whether a small extra dose of vitamin D from fortification during gestation was associated with a lower risk of developing IBD in the offspring. **Method:** In 1985, mandatory fortification of margarine with vitamin D in Denmark was canceled. To investigate the effect of this policy change, we selected all individuals from 2 full year birth cohorts before and after the termination of the mandatory fortification. All individuals were followed for 30 years. By merging data from the Medical Birth Registry with the Danish National Patient Registry, individuals with IBD were identified. **Results:** 217,249 individuals were included in the analysis. A total of 875 among the exposed and 1102 among the unexposed fulfilled the criteria for being diagnosed with IBD. A lower odds ratio OR = 0.867 (95% CI: 0.792; 0.947) for IBD was observed among those who had been exposed to extra vitamin D from fortified margarine during gestation, compared to those who had not been exposed. The analysis was adjusted for sex and season of birth, but results were essentially similar before and after adjustment. **Conclusion:** This study shows that a small extra dose of vitamin D from fortified margarine during gestation might lower the risk of developing IBD in the offspring until the age of 30.

4. Prevalence of Thinness and Stunting in the Spanish Population

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Background: Undernutrition and overweight are two important public health problems due to the magnitude, trends, and impact on health and quality of life. Both situations are increasingly associated with poverty. The objective of this work was to describe the prevalence of thinness and stunting in the Spanish population under 18 years of age. **Methods:** The data analyzed come from the ENPE study (Nutritional Study of the Spanish Population), a cross-sectional study conducted in a random population-based sample. Trained surveyors performed measurements of weight, height, and circumferences according to standardized protocols using approved materials. Thinness and stunting were defined according to the criteria and standards of the World Health Organization (slight -1 SD, moderate -2 SD, and severe -3 SD). **Results:** The prevalence of mild thinness (-1 SD) is estimated at 7.3%, and it is lower in medium-sized localities and higher in girls whose mothers are highly educated and belonging to favored socioeconomic environments. In boys, however, it is higher in low socioeconomic environments. The estimated prevalence of stunting in Spanish children and young people is 3.9%, higher in children between 3 and 8 years old (7.7%). It is greater in children and young people belonging to families with low socioeconomic status. In 1.8%, short height-for-age coincides with overweight, up to 3.4% in boys and girls between 3 and 5 years old. **Conclusions:** The prevalence of thinness in Spain is low and the distribution is different in boys and girls. The prevalence of stunting is low in Spain, higher in the group between 3 and 8 years and in children of families with low socioeconomic status.

Funding: The ENPE study received funding from the Eroski Foundation and the Spanish Society of Community Nutrition. This analysis was conducted in the context of the report "The state of childhood 2019 on childhood, nutrition and nutrition" prepared for the UNICEF Spanish Committee.

5. Added Sugar Intake and Dietary Glycemic Load Are Associated with Heart Failure Biomarker

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Background: The association between added sugar (AS) and saturated fat (SF) intake with heart failure (HF) has been shown, yet this relationship has not been well elucidated, particularly with the B-type natriuretic peptide (BNP), a HF biomarker. **Objective:** This study aimed to estimate the association between AS and SF intake, and dietary glycemic response indicators with serum BNP levels. **Methods:** Data came from a random sample examined in DIGITALIS, a study designed to estimate the prevalence of HF in the population assisted by the Family Doctor Program in the municipality of Niterói, Brazil. All individuals with information on dietary intake and serum BNP were included. Food consumption was assessed by means of an FFQ, and serum BNP (outcome) was measured by the chemiluminescence method. AS and SF intake and dietary glycemic index (GI) and load (GL) (exposure variables) were estimated. Gamma regression with link log was used to estimate the association between exposures and outcome adjusted for: sex, age, BMI, skin color, schooling, serum cholesterol, LDL-cholesterol and glucose, hypertension, diabetes mellitus, and daily energy intake (statistical significance: $p \leq 0.05$). **Results:** Sample ($n = 414$; 63% women) mean values were: age: 58.6 years old (SD: 9.5); BNP: 32.3pg/dL (SD: 119.3); AS: 116.5g/day (SD: 101.3); SF: 33g/day (SD: 17.7); GI: 53.5 (SD: 4.0); and GL: 206.3 (SD: 104.2). In the multivariate analysis, an increase in 1 g in AS intake was associated with 0.2% BNP increase (Exp (β) = 1.002; $p < 0.01$); an increase of a unit in dietary GL was associated with 0.4% BNP increase of (Exp (β) = 1.004; $p < 0.01$). GI and SF had no association with the BNP levels. **Conclusion:** The quality and amount of dietary carbohydrate may be related to the pathophysiology of HF, possibly by contributing to the increase of serum BNP levels.

6. Analysis of the Anti-Inflammatory Capacity of Bone Broth in a Murine Model of Ulcerative Colitis

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Bone broth is a rich source of amino acids, minerals, and proteins; for this reason, it has been used for many years in the prevention and treatment of several diseases. The present work was conducted to evaluate the nutritional composition of beef bone broth and its therapeutic potential in a model of ulcerative colitis. The bones were boiling for 8 hours at 100 °C. Characterization of minerals was carried out by inductively coupled plasma optical emission spectrophotometry and amino acids by high performance liquid chromatography. Bone broth was administered daily to BALB/c mice for 10 days before the intrarectal administration of 2 mg of 2,4,6-trinitrobenzenesulfonic acid (TNBS) dissolved in 4% acetic acid. Colon samples were collected and studied by histopathology, in addition to determining the relative abundance of proinflammatory cytokines. Among the main minerals present in the bone broth were: sodium, calcium, phosphorus, potassium, and magnesium (125.84, 64.16, 20.37, 19.61, and 18.46 mg/L). The beef bone broth was rich in glutamic acid, histidine, arginine, aspartic acid, lysine, glycine, threonine, and valine (15.06, 13.21, 5.19, 5.03, 4.53, 4.51, 4.43, and 4.26 g aa/100 g of sample). After the establishment of the colitis model, animals treated with purified water showed a severe architectural distortion of the colonic mucosa, erosions of the epithelium, crypts distortion, and the presence of abundant erythrocytes and neutrophils. On the other hand, the mice treated with beef bone broth presented a more conserved epithelium, moderate distortion of the crypts, and moderate presence of erythrocytes and neutrophils. At histological level, the administration of beef bone broth in BALB/c mice decreases the damage caused by the intrarectal administration of TNBS and acetic acid.

7. Antihypertensive and Antioxidative Effects of Sangyod Rice Bran Hydrolysates in L-NAME-Induced Hypertensive Rats

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Hypertension is one of the most common chronic diseases and a major risk factor for cardiovascular disease. Increased oxidative stress and reduced nitric oxide (NO) bioavailability in the vascular system are involved in the development of hypertension. Inhibition of nitric oxide (NO) synthesis with N^ω-nitro-L-arginine methyl ester (L-NAME) induces a marked increase of blood pressure, endothelial dysfunction, and oxidative stress. Rice bran hydrolysates contain highly nutritional proteins and antioxidant compounds, which show benefits against hypertension. Sangyod rice bran hydrolysates (SRH) extracted from red colored rice is a rich source of nutrients and phytochemical compounds. The present study aimed to investigate whether SRH could reduce blood pressure, endothelial dysfunction, and oxidative stress in L-NAME-induced hypertensive rats. Hypertension was induced in male Sprague-Dawley rats by administration of L-NAME (50 mg/kg/day) in drinking water for 6 weeks. Hypertensive rats were orally administered with SRH (250 or 500 mg/kg/day) for the last 3 weeks of L-NAME administration. SRH in a dose-dependent manner reduced arterial blood pressure and peripheral vascular resistance and increased endothelium-dependent vasodilation. Moreover, SRH alleviated oxidative stress by decreasing vascular superoxide production, plasma malondialdehyde, and plasma protein carbonyl. Treatment with SRH was associated with increased plasma nitrate/nitrites levels and upregulation of eNOS. The antihypertensive actions of SRH involve the improvement of NO bioavailability and the reduction in oxidative stress.

8. Assessing the Influence of Nutritional and Social Factors on Children's Development in Rural Communities in Puno, Peru

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Chronic malnutrition in children is a major health challenge in developing countries. Malnutrition is associated to cognitive deficits and poor academic performance, which often leads to a significant drop in adulthood work capacity. Few studies have investigated the effect of child nutrition programs that consider social and nutritional factors in the fight against malnutrition. In this regards, this works aimed to study the impact of the factors of complementary foods, nutrition education given to mother, children age, and mother age on the weight and height of children below three years of age from rural communities in Puno, Peru. To achieve this purpose, data were collected from families classified as high-risk by the child nutrition program. A screening of the factors considered was performed, which was achieved by the calculation of second-order polynomial models based on the 2⁴ full factorial design. This approach was capable of providing a simultaneous study of the factors and their interactions. The results showed that the factors that significantly influenced the weight and height of children (at 95% significance level) were nutrition education given to mother and complementary foods. With these results, it is reasonable to affirm that the intervention of the child nutrition program that considers nutritional and social factors contributed to improvement of the knowledge, practices, and nutrition state of the investigated communities. Nutrition program planners and policymakers should consider multiplying efforts to provide adequate nutrition education to mothers. Improving nutrition in developing countries is a driver of sustainable economic growth.

9. Association of *IL-6* and *TNF-α* Gene Polymorphisms with Diabetes Mellitus Type 2 in a Sample of Mexican Population

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Introduction: Diabetes mellitus is one of the most important chronic complications. *IL-6* and *TNF alpha* have been strongly related to the etiology of diabetes mellitus type 2 (T2DM). The expression of inflammatory cytokines may be modulated by single nucleotide polymorphisms (SNPs) located in the regulatory regions of *IL-6* and *TNFα* genes. **Methods:** We included a total of 200 individuals, 100 individuals with T2DM diagnosis (cases) and 100 individuals without it (controls). Restriction fragment length polymorphism (RFLP) analyses were used to assess the *IL-6*-174, -572 and -597, *TNFα*-308 and -238 polymorphisms. **Results:** We found statistically significant differences between the body mass index, glucose levels, triglycerides, and HbA1c between cases and controls. The C/C genotypes of the polymorphisms-174 and -597 of *IL-6* and the A/A genotypes of the *TNFα*-308 and 238 polymorphisms were associated with the risk of T2DM. Glucose levels were higher in cases and controls with the G/A genotype of polymorphism-597 of *IL-6*. **Conclusions:** We found a relationship with the risk of T2DM with polymorphisms-174 and -572 of *IL-6*, -308, and -238 of *TNFα* in the Mexican population. A greater number of risk polymorphisms present of *TNF alpha* and *IL-6* in a sample of the Mestizo population may generate a higher risk of developing T2DM.

10. Association of Methylation Patterns of *FTO* and *BDNF* Genes with the Risk of Eating Disorders and Comorbidities in a Sample of University Students

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Introduction: It has recently been reported that university students, as a general group, are affected by eating disorders (ED), because in the university environment, there are factors present that increase the possibility that students experience states of anxiety and depression. Several studies have shown that allelic variants of genes of the dopaminergic pathway are associated with the etiology of eating disorders. **Objective:** We analyzed the association of methylation patterns in the *FTO* and *BDNF* genes with the risk of eating disorders, depression, and anxiety in university students. **Methods:** A case-control study was conducted with 103 students of both sexes between 18 and 35 years old ($x = 23 \text{ years} \pm 5.39 \text{ years}$). The methylation patterns of the *FTO* and *BDNF* genes were obtained by MS-PCR. The Eating Attitudes Test-40 was applied for the detection of risky ED. Beck's anxiety inventory and Beck's depression questionnaire were applied to detect anxiety and depression, respectively. **Results:** A total of 10% of the students presented a risk of eating disorders, 18% moderate anxiety, 9% severe anxiety, and 13.6% moderate depression. A total of 96 students reported hypomethylation and 3 hypermethylation of the *FTO*. A total of 97 subjects reported hypomethylation and 2 hypermethylation for *BDNF*. We found a homogeneous distribution of the methylation pattern for both genes in the groups with presence of anxiety and depression. We obtained a positive correlation ($p = 0.02$) with *FTO* methylation pattern and age; we also found a positive correlation of anxiety with BMI ($p = 0.03$). On the other hand, we found a positive correlation of the risk of eating disorders with respect to age ($p = 0.03$). **Conclusions:** University students are a high-risk group for ED. There is a positive relationship between eating disorders and risk and age. The methylation patterns of the *FTO* and *BDNF* genes are similar in the groups with and without risky eating behaviors.

11. Consumption of High-Protein Diet by Male Rats before Conception Alters Insulin Sensitivity and Glucose-Induced Insulin Secretion In Vivo in the Offspring

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Adult disease risks are associated with nutritional environment experienced during perinatal life. While the impact of maternal nutrition on the health of the offspring is well documented, the potential implication of paternal nutrition before conception on the metabolic health of the progeny remains underexplored. The aim of this study was to investigate the impact of paternal high-protein diet (HPD) consumption on the development of the pancreas and the parameters of glucose homeostasis in offspring in rat. Male Wistar rats were given a high-protein diet for two months. They were then mated with female rats fed a standard diet. Wistar male rats fed a standard diet (SD) were used as controls. The progeny (F1) was studied at fetal stage (E18) and in adulthood, at 3 and 6 months of age. Body weight, plasma glucose, and insulin were monitored in both male and female F1 offspring. Glucose tolerance (GT), glucose-induced insulin secretion in vivo (GIIS), and whole-body insulin sensitivity were assessed. At fetal stage, we found no significant difference in the pancreatic beta cell mass between fetuses from HPD fathers and those from SD fathers. After birth and up to the 6-month period of the study, the body weight and basal plasma glucose and insulin were similar between both male and female F1 from HPD and SD fathers. Regarding body mass composition, F1 males from HPD fathers had increased fat mass and decreased lean mass compared to age-matched F1 males from SD fathers. Insulin sensitivity, GT, and GIIS were not statistically different between F1 females from HPD and SD fathers. Conversely, F1 males from HPD fathers exhibited increased insulin sensitivity and decreased GIIS in vivo. In conclusion, the consumption of HPD by male genitors alters insulin sensitivity and glucose-induced insulin secretion in vivo only in their male progeny.

12. Correlation between Anthropometric Measurements with Blood Pressure and Biochemical Indicators of Cardiovascular Diseases in Mexican Early Adults

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Objective: The purpose of the present study was to correlate quick and affordable anthropometric measurements with blood pressure and biochemical indicators of cardiovascular diseases in Mexican early adults. **Methods:** A Cross-sectional study that included 62 young adults of both sexes with a wide range of BMIs was conducted. Anthropometric data were evaluated with standardized methodologies using calibrated equipments. Body fat (BF) was measured by bioimpedance, and body mass index (BMI) and waist-to-hip ratio were calculated. Total cholesterol (TC), HDLc, TAG (Triglycerides), and glucose were measured from peripheral blood samples by enzymatic colorimetric methods, LDLc was calculated using Friedewald equation. Blood pressure was measured using an automatic arm blood pressure monitor. Statistical analysis was done using STATA 13. **Results:** A positive correlation was observed between BMI and TAG ($r: 0.44; p = 0.003$), glucose ($r: 0.31; p = 0.01$), SBP ($r: 0.41; p = 0.0007$), and DBP ($r: 0.42; p = 0.0006$) and a negative correlation with HDLc ($r: -0.35; p = 0.005$). Waist circumference was positively correlated to TAG ($r: 0.56; p \leq 0.0001$), glucose ($r: 0.39; p = 0.001$), SBP ($r: 0.51; p = 0.001$), and DBP ($r: 0.41; p = 0.0001$), but negatively correlated to HDLc ($r: -0.50; p \leq 0.0001$). A positive correlation was observed between waist-to-hip ratio and TAG concentrations ($r: 0.60; p \leq 0.00001$), glucose ($r: 0.40; p = 0.001$), SBP ($r: 0.59; p \leq 0.0001$), and DBP ($r: 0.36; p = 0.003$), and a negative correlation with HDLc ($r: -0.64; p \leq 0.0001$). There was no correlation between BF and blood pressure and biochemical indicators. TC and LDLc were not correlated with any of the anthropometric measurements. **Conclusion:** BMI, waist, and waist-to-hip ratio are better indicators of TAG, glucose, HDLc, SBP, and DBP alterations than BF. None of the anthropometric measurements were correlated to TC and LDLc levels.

13. Design of New Teaching Tool to Help Patients with Oropharyngeal Dysphagia to Adapt to Texture-Modified Foods and Fluid Thickening

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Background: Oropharyngeal dysphagia (OD) and malnutrition (MN) are highly prevalent in older patients, associated with a poor outcome with one-year mortality (65.8%). We have developed a strategy to treat OD and MN with the triple adaptation of the traditional Mediterranean diet in a rheological, nutritional, and organoleptic manner. Nonetheless, it is difficult to change the cooking habits of patients and families. **Aim:** To develop an online guidance material for OD patients and carers, teaching how to adapt the diet to each patient's nutritional and texture needs. **Methods:** We have designed an online website where video-recipes and menus will be shown covering the patients' nutritional needs. Recipes were selected according to the triple adaptation strategy (Costa, *Nutrients* 2019). Two fluid viscosities (250 and 800 mPa-s) and two food textures (thick purée 'C', fork-mashable 'E') were selected, as two levels of caloric and protein content. An algorithm was established to log into the website in order to show the recipes and menus with the optimal viscosity and texture, and nutritional content recommended for each patient's needs.

Results: A total of 298 recipes, 50 video-recipes, and 4 menus were classified according to the algorithm for the prescription of fluids and solids. For fluids, video-recipes show how to prepare the correct viscosity level: 50 mPa-s, 250 mPa-s, and 800 mPa-s (depending on the severity, previously assessed by VVS-T). For food, recipes and menus were classified according to the texture prescribed (C and E) and previous nutritional status based on MNA assessment. **Conclusions:** The design of a website containing menus and video-recipes and fluid adaptation can help patients with OD and MN and their carers to know how to adapt their diets. This new teaching tool might have a major impact on the clinical outcomes of these patients.

14. Diet and Physical Activity Intervention to Evaluate Changes in Body Composition, Dietary Intake, and Cytokines among Breast Cancer Survivors from Northwestern Mexico

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Introduction. The 5-year survival rate of breast cancer (BC) in Mexico is less than 60%, and prevalence of obesity in Mexican women is high. Obesity may be linked to cytokines such as leptine, adiponectine, and vascular endothelial growth factor (VEGF) that may be related to breast cancer. The objective was to determine changes in body composition, energy and macronutrient intakes, leptin, adiponectin, and VEGF in BC survivors after an 8-month intervention on diet and physical activity. **Methods.** In this clinical trial, BC survivors ($n = 47$) were randomized to the intervention group (IG, $n = 22$) that received a strategy based on specific goals for diet and physical activity, or the comparison group (CG, $n = 25$) that received nutritional counseling. Measurements at baseline, 4, and 8 months included body weight, height, waist circumference, body fat, and physical activity. Blood samples were taken at 0, 4, and 8 months. We measured leptin and adiponectin by an enzyme-linked immunosorbent assay, and VEGF was evaluated by flow cytometry. **Results.** The average age of the participants was 49 years. At eight months, the intervention group decreased fat consumption and the comparison group increased it (-3.61 ± 9.02 vs. 3.47 ± 12.6 , $p = 0.05$). At 4 and 8 months, women in the IG lost 1.75 kg and 2.1 kg of body weight compared to 0.70 kg and 1.4 kg in the CG ($p > 0.05$). Participants in the intervention group at 8 months decreased leptin 17.3 ± 20.4 ng/mL compared to the comparison group that increased leptin levels 3.4 ± 14.9 ng/mL ($p = 0.05$). There were no significant differences between groups on the changes of VEGF levels. **Conclusions.** The diet and physical activity program may be effective to produce desirable changes in some of the variables of interest in this study.

15. Dietary Factors Associated with Metabolic Syndrome in Korean Adults

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Metabolic syndrome (MetS) means being at increased risk of cardiovascular diseases and type 2 diabetes, and the prevalence of the MetS has recently been increasing in Korean adults. The objective of this study was to examine the association between dietary factors and MetS in Korean adults. Study subjects were recruited from the Cancer Screening Examination Cohort in Korea between 2004 and 2017. A total of 16,032 subjects (8439 men and 7593 women) aged 20 years or older were included in the final data analysis. Dietary intakes were obtained from 3-day food records. MetS was diagnosed according to the National Cholesterol Education Program Adult Treatment Panel III criteria, with a modified waist circumference cutoff for Korean. The general linear model was performed to examine differences in dietary factors. The prevalence of MetS was 15.0% (19.3% for men, 10.1% for women). In men, we found a higher prevalence of elevated blood pressure (40.3%), abdominal obesity (37.4%), and elevated serum triglycerides (33.7%) than other conditions. In women, the prevalence of abdominal obesity (30.7%) and elevated blood pressure (24.7%) was higher than others. Among nutrient factors, those with MetS showed lower intake of calcium compared to those without MetS in both men ($p = 0.001$) and women ($p = 0.040$). Among food groups, men with MetS had higher intake of meat ($p = 0.015$) and alcohol ($p = 0.001$), whereas women with MetS had higher intake of cereals ($p = 0.019$) than those without MetS. Both men and women with MetS had lower intake of dairy products ($p = 0.001$, $p = 0.032$ respectively) than those without MetS. In summary, our study showed that the dietary factors associated with the risk of MetS were high intake of meat and alcohol in men, while high intake of cereals in women. Moreover, low intake of dairy products might be associated with the risk of MetS in our subjects. Dietary recommendations for prevention and management of MetS can be suggested based on the results of this study.

16. Does Cesarean Section or Preterm Delivery Influence TGF- β 2 Level in Human Colostrum?

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Human colostrum (HC) is an incredibly rich source of immune mediators, including TGF- β , which regulates cellular homeostasis and inflammation, can induce or suppress immune responses, limits Th1 reactions, and stimulates IgA production. Recent studies have shown the particular interactions between probiotic bacterial strains and cytokines. Human milk TGF- β 2 decreases apoptosis of intestinal cells and suppresses macrophage cytokine expression.

The aim of the study was to determine concentration of TGF- β 2 in HC obtained from mothers who delivered vaginally (DV) or by cesarean section (CS) and to compare concentration of TGF- β 2 in HC in term (TB) and preterm (PB) birth.

Concentrations of TGF- β 2 were measured in HC from 299 women, who delivered in the 1st Department of Obstetrics and Gynaecology, Medical University of Warsaw: 192 (DV), 107 (CS), 251 (TB), and 48 (PB). Colostrum samples were collected within 5 days postpartum. TGF- β 2 levels in HC were measured by ELISA test with the Quantikine ELISA Kit- Human TGF- β 2. Statistical significance between groups was calculated by Student *t*-test using Statistica 13 software.

Levels of TGF- β 2 were significantly higher in HC after CS than DV (7.294 vs. 4.895 ng/mL; $p = 0.0005$). Levels of TGF- β 2 in HC was higher after BP than TB (6.911 vs. 5.531 ng/mL). However, this difference was not statistically significant ($p = 0.1244$). In our research, most BP (56%) were given via CS.

Data from this study suggest that cesarean section was associated with increased levels of TGF- β 2 in HC. The increased levels of TGF- β 2 in HC of women who delivered prematurely requires further research. Early and exclusive breastfeeding by mothers after cesarean section and premature births with colostrum may prevent the negative impact of pathogens which often colonize the gastrointestinal tract and may reduce the risk of chronic diseases in this group of patients.

17. Effect of a Three-Month Low Glycemic Index Diet Combined with Caloric Restriction on Body Composition and Insulin Resistance Index (HOMA-IR) in Overweight Women

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Epidemiological studies indicate that consumption of foods with a high glycemic index and sedentary lifestyle can be associated with obesity, insulin resistance (IR), and diabetes mellitus type 2. Our study was designed to examine the effect of a three-month low glycemic diet combined with caloric restriction on body weight (BW), body mass index (BMI), waist circumference (WC), hip circumference (HC), waist–hip ratio (WHtR), body fat percentage (%F), and insulin resistance index (HOMA-IR) in overweight women ($n = 20$, aged 29.3 ± 5.6 years, BMI 28.2 ± 4.4) with abdominal obesity (WHR ≥ 0.8) and IR (HOMA-IR ≥ 2.5). At three months, the daily energy intake was reduced by 30% compared with women's total metabolic rates, while consumption of low glycemic load foods was increased. Anthropometric measurements and HOMA-IR were evaluated at baseline and at three months. This study revealed that a three-month dietary intervention affected the loss of body weight by an average of 6 kg, while BMI, WC, HC, WHtR, and %F were decreased by 11%, 6%, 5%, 4%, and 9%, respectively. At three months, HOMA-IR was lower by 30%. These results suggest that consumption of a low glycemic index diet combined with caloric restriction is effective for improving body composition, and reducing HOMA index, therefore, may contribute to the prevention of diabetes mellitus type 2.

18. Effect of Caffeine on Antioxidants and Oxidative Homeostasis

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Caffeine is a metabolite from the coffee genus and some other plants. *Coffea arabica* and *C. canephora* and tea plants *Camellia sinensis* are some examples. In the organism, caffeine can influence various pathways from which antagonism on the adenosine receptors is the main effect. On the other hand, there are some minor pathways remaining undisclosed. In this experiment, the role of caffeine in oxidative stress homeostasis was researched. The experiment described here was done in a model consisting of BALB/c female mice. The mice received caffeine solution in a dose from one to 64 mg/kg, and organs were collected after the animals were sacrificed. Thiobarbituric acid reactive substances (TBARS) and ferric reducing antioxidant power (FRAP) were measured in the organs. The investigation showed a significant increase of TBARS in the kidney, while the brain (cortex region) contained lower TBARS levels due to caffeine. The second marker, FRAP, was increased in the kidney in a dose-dependent manner. The levels of TBARS and FRAP were not influenced by caffeine in the other organs like the heart, liver or muscles. In conclusion, caffeine was proven to be able to influence oxidative homeostasis, but its effect is unequal for various organs. Kidneys and brain seem to be more sensitive to the effect of caffeine compared to the other tested organs. The effect of caffeine on neurodegenerative disorders like Alzheimer's disease can be presumed because of influencing oxidative homeostasis in the brain. The findings are in correlation with recent clinical findings.

19. Effects of Dietary Carotenoids on Gene Expression during the Dietetic Treatment of Steatosis

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Non-alcoholic fatty liver disease (NAFLD) is the liver disease disseminated most widely around the world due to genetic, dietary, and lifestyle factors. Several studies have reported that carotenoids can contribute positively to liver health, and their consumption has been inversely associated with the prevalence of NAFLD. The purpose of this work was to evaluate the effect of dietary carotenoids from spinach and tomato on the liver lipid profile and liver transcriptome in Sprague-Dawley rats, with steatosis induced by a high fat and fructose diet. After steatosis was confirmed, three experimental groups were designed, control group: fed maintenance rodent diet, and HC and LC groups: fed with a rodent maintenance diet supplemented with a high (12.75%) and a low (25.5%) level of rich carotenoids powder prepared with lyophilized tomato and spinach. Animals were fed ad libitum for 5 weeks and were sacrificed to collect the liver samples to analyze the lipid profile, and to evaluate the expression of gene and the content of some proteins related to steatosis. The cholesterol level and total TGA decreased significantly as a function of the intake of carotenoids. In the HC and LC groups, nineteen genes showed a significantly differential expression ($p < 0.05$), all of them showing an overexpression of the mRNA (fold change > 2), in comparison with the control group. Particularly, the overexpression of Nr1h2, Acox, and ApoA1, and the increase of the encoded proteins improved the β -oxidation and cholesterol metabolism, whereas the overexpression of Igfbp1 and the increase of its encoded protein improved the insulin resistance associated with steatosis. These results showed that carotenoids can modulate the gene related to lipid and carbohydrate metabolism in liver, and hence, their consumption must be considered in the dietary treatment of steatosis.

20. Glycemic Index of the Diet Is a Good Predictor of Insulin Resistance among Brazilian Adolescents

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Glycemic indices (GI) and glycemic load (GL) of foods are considered drivers in obesity and type 2 diabetes, but their role is still inconclusive. A large national school-based sample of nondiabetic adolescents was evaluated to measure the effect of GI, GL, fiber, and protein content of the diet on HOMA-IR and fasting insulin. Students aged 12 to 17 years, from 273 municipalities, were interviewed in 2013/2014 when one 24-h recall of food intake and biochemical assays was collected. For males ($n = 14,134$), the markers of insulin resistance were negatively associated with protein intake with Pearson correlation coefficient (r) of -0.05 (p -values < 0.001), for both insulin and HOMAIR. For females ($n = 21,327$), these correlations were -0.03 (p -values < 0.001). Fiber was negatively correlated with insulin and HOMA-IR ($r = -0.06$; p -values < 0.01). As expected, insulin and HOMA-IR were associated with body mass index (BMI) z-score ($r = 0.32$). Regression models, stratified by weight status, (normal weight = BMI ≤ 1 z-score and overweight = BMI z-score > 1) showed that the GI was associated with HOMAIR and insulin, whereas GL was not associated with both markers. Adjustment for sex, age, protein, and fiber intake did not change the associations. Regression coefficients were twice as high in overweight adolescents in relation to those with normal weight (HOMAIR: $\beta = 0.007$, $p = 0.006$ for overweight and $\beta = 0.003$, $p < 0.001$ for normal weight). These results for insulin were higher, but also twice as high among the overweight adolescents ($\beta = 0.033$, $p = 0.004$; $\beta = 0.015$, $p < 0.001$). GI, protein, and fiber influenced markers of insulin resistance among health nondiabetic adolescents. Comparing the 1st with the 4th quartile of GI intake HOMA-IR increased 11% among those overweight and increased 4.8% among that normal weight. GI, but not the load, has an important effect on markers of insulin resistance, mainly among overweight adolescents.

21. Hidden Risks in Thickening Agents

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Introduction Compensatory treatment of OD has focused for the most part on fluid thickening by increasing bolus viscosity, a valid therapeutic strategy to reduce the risk of airway invasion. Bolus viscosity is mainly affected by two factors: shear rate (related to bolus velocity in the pharynx) and oral α -salivary amylase (α -SA). However, patients who suffer from OD are prescribed with thickening agents (TA) with unspecified viscosities using qualitative descriptors: (N), honey (H), and pudding (P) and without considering the main factors affecting to it. **Aim** To compare viscosities at 50 s^{-1} , to assess shear viscosities (at 300 s^{-1}), and to determine the effect of the α -SA of 4 different TAs at each manufacturer's recommended level (N, H, and P). **Material and methods** We used a viscometer to assess the levels of viscosity at the shear rate of 50 s^{-1} (oral phase) and 300 s^{-1} (pharyngeal phase) and after 30 s of oral incubation to analyze the effect of the α -SA. **Results** Viscosities in the oral phase (50 s^{-1}) commercialized under the same descriptor vary enormously ranging between 83.5–346.8 mPa·s (N), 255.6–1098.6 mPa·s (H) and 377.1–6909.6 mPa·s (P). Increasing shear rate (300 s^{-1}) caused a strong decrease in viscosity up to 58.5–78% from its oral viscosity. Viscosities after oral incubation (α -SA) decreased in a significant manner: 97.7–76% for starch-based ($p < 0.05$), 41.9% for gum-based ($p < 0.05$), and surprisingly, one gum-based thickener experimented with an increment of viscosity of 11% ($p < 0.05$). **Conclusions** Current labeling of TA can be improved with the use of SI values (mPa·s) for viscosity and showing the effect of shear rate and α -SA as in the ESSD labelling system. This system avoids the use of qualitative descriptor and includes an appropriate characterization of the product for the benefit of our patients.

22. Influence of a Community-Based Lifestyle Intervention Program Including Recommendations for a Plant-Based Diet on Cardiovascular Risk Parameters

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Background: Cardiovascular disease (CVD) is the leading cause of death in industrialized countries and worldwide. The concentrations of serum total and LDL cholesterol as well as a higher intima media thickness of the common carotid artery (ccIMT) are associated with higher CVD risk. Measuring ccIMT makes it possible to already assess the atherosclerotic process at the subclinical stage. **Methods:** A two-year nonrandomized, controlled intervention study with 6 times of measurement (baseline; at 10 weeks; at 6, 12, 18, and 24 months). Participants of the intervention group ($n = 112$) took part in a ten-week intensive lifestyle program (including bi-weekly group sessions, workshops, and personal health coaching at baseline and at 10 weeks), followed by a less intensive phase (monthly lifestyle education group sessions). The control group ($n = 87$) did not take part in any program. In both groups, CVD-related parameters were assessed, including cholesterol (total, LDL, HDL), ccIMT (not assessed at 10 weeks), as well as health behavior (questionnaires). In between group means were compared with ANOVA using IBM SPSS 24. **Results:** After 10 weeks, the intervention group showed a reduction in total, LDL, and HDL cholesterol values compared to baseline ($p < 0.01$). In the control group, these parameters did not change. After 6 months, there was no statistically significant difference in ccIMT change between intervention and control. The 6-month blood results are not available yet. **Conclusion:** Our lifestyle program led to clinically relevant reductions in total and LDL cholesterol. Continued follow-up will show whether the improvement of cholesterol levels will be maintained in the intervention group and whether ccIMT will differ between intervention and control.

23. Longitudinal Association of Whole and Refined Grain Consumption and Cardiometabolic Risk Factors

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Studies suggest that whole grain (WG) consumption may reduce the risk of cardiovascular disease (CVD); however, few prospective studies have examined WG and intermediate cardiometabolic markers. We examined the prospective relationship of WG and refined grain (RG) consumption with cardiometabolic risk factors. Subjects were participants in the Framingham Offspring cohort (n = 3528) with mean baseline age of 54.2 years (SE = 0.16) and BMI of 27.3 kg/m² (SE = 0.11). Diet, health, and lifestyle data were collected approximately every 4 years over a median total of 18 years. Repeated measure mixed models were used to estimate adjusted mean four-year change in each risk factor per quartile of WG (g/day) or RG (servings/day). We adjusted sequentially for (1) age, sex, energy intake, smoking, physical activity, alcohol consumption, diabetes, lipid and hypertension medications; (2) change in waist circumference (WC); and (3) other dietary factors. In fully-adjusted models, greater WG intake was associated with lower fasting blood glucose (four-year change of 1.64 ± 0.3 mg/dL in lowest quartile versus 0.85 ± 0.2 in highest (mean ± SE), p-trend = 0.004). A significant interaction with sex was observed (p = 0.0007). When stratified, both men and women had reduced blood glucose with higher WG; however, the association was stronger in men and did not maintain statistical significance for women after adjusting for other dietary factors. Conversely, greater RG intake was associated with greater four-year increase in glucose (0.67 ± 0.2 in lowest quartile versus 1.64 ± 0.3 in highest, p-trend = 0.03). A higher HDL cholesterol concentration was observed with higher WG and lower RG but was not statistically significant after adjustment for change in WC. Greater WG intake and lower RG intake is prospectively associated with improvements in fasting glucose, particularly among males. Replacing RG foods with WG equivalents may be an effective dietary modification to attenuate hyperglycemia over time and reduce the risk for cardiometabolic disease.

24. Maintenance Hemodialysis (MHD) Patients Undergo Minimal Biochemical Changes during Ramadan

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The annual Ramadan (R) festival results in dramatic changes in eating habits, with individuals undergoing daily fasting (sunrise to sunset) for up to 1 month. Although sick people are exempt, patients on MHD may opt to participate in the festival. We evaluated 45 subjects in an out-patient dialysis clinic in Saudi Arabia during R. Data was obtained 1 month prior to R (T0), during R (TR) and 1 (T1) and 2 months-post R (T2). The subject demographics were: Age 50 + 17 years, 49% males, 69% married, 56% high school education or higher, 20% employed, dialysis vintage 78 + 61 months and 44/45 underwent thrice weekly dialysis. Kt/V values, serum calcium, ferritin and phosphorus were unchanged over the entire study period. Random blood glucose was transiently, but significantly higher at T1 vs. T2. Serum albumin, potassium, creatinine and sodium showed transient changes at various times over the course of the study, but all of these were within acceptable clinical values. Total iron binding capacity was significantly lower at TR as compared to values at T0 and T2. Plasma lipid changes over the course of the study were minor and within acceptable guidelines. The distribution of low and high density lipoprotein particle sizes (small, intermediate and large LDL and HDL) were unchanged as were mean LDL particle diameters. In addition, anthropometric assessments were carried out including hand-grip strength (HGS), mid-arm muscle circumference (MAMC) as well as nutritional assessment using multiple 24 h recalls. Diet data was available for 29 subjects of whom 21 were acceptable reporters for energy intake. Amongst the latter, calorie intake at TR (2139 + 120 kcal/d) was significantly higher than the value noted at T2 (1755 + 155 kcal/d) and this was associated with significant increases in protein (69 + 4 vs. 60+4 g/d) and fat (97 + 6, vs. 73 + 4 g/d), respectively. No changes were noted with respect to HGS and MAMC. These data show that for MHD patients, the period of R despite changes in nutrient intake, results in temporal or non significant effects on clinically-relevant parameters.

25. Mediation Effect of Self-Efficacy, Self-Management Behaviors, and Dietary Intake in Effect of Health Literacy and Exercise-Focused Interventions on A1c Level in Chinese Diabetes Patients

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Objectives: This study aimed to identify potential mediation factors in the significant effect of health literacy and exercise interventions on A1c in Chinese diabetes patients based on an RCT. **Methods:** In this RCT cluster, 799 T2DM patients were recruited from 8 communities in Shanghai, China, and randomized into one control arm and three intervention arms receiving 1-year interventions of health literacy, exercise or both. Questionnaire-based survey and medical check-up were conducted at baseline and at the end of interventions. The generalized estimated equation was used to evaluate the effect of interventions on self-efficacy, self-management behaviors, and dietary intake. Bootstrapping with 1000 replications was used in path analysis to estimate the direct and indirect effects of interventions on A1c. **Results:** A total of 95.5% of the participants were followed-up after 1-year interventions. The self-efficacy score increased in the comprehensive ($\beta = 5.68$, $p = 0.0009$) and control groups ($\beta = 5.81$, $p = 0.0002$) at 12 months compared with at baseline. All the four groups spent more days per week engaging in self-management behaviors at 12 months than at baseline, particularly in dietary behaviors. According to the dietary data, the health literacy group was more likely to meet the standard of energy intake than the control group at 12 months (adjusted OR: 2.68, 95%CI: 1.26–5.68) but less likely to maintain an appropriate proportion of fat intake (adjusted OR: 0.13, 95%CI: 0.02–0.84). More patients in the comprehensive group achieved the goal of carbohydrate intake than in the control group, accounting for 50–65% of total energy (adjusted OR: 3.29, 95%CI: 1.11–9.71). In path analysis, we observed significant direct effects of interventions on A1c but did not find any mediation effect of self-efficacy, self-management behaviors, and dietary intake in the effect of interventions on A1c. **Conclusions:** The health literacy and comprehensive interventions may improve certain self-efficacy, self-management behaviors, and dietary intake in Chinese diabetes patients, but these factors may not mediate the effect of the intervention on A1c level.

26. Physically Active Lifestyles Promote Healthier Dietary Patterns and Improved Metabolic Health Markers in Women

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Background: Lifestyle factors such as physical activity (PA) and dietary intake can improve long-term health outcomes. The aim of this study was to investigate relationships between adherence to physical activity guidelines and body composition, metabolic health markers and dietary patterns of New Zealand women. **Methods:** Participants were 348 healthy women aged 16–45 years from the EXPLORE study. Sedentary behaviour, physical activity and adherence to physical activity guidelines were assessed via a 7-day hip-worn accelerometry protocol. Fat and lean mass (total, regional) were assessed using air displacement plethysmography and dual X-ray absorptiometry. Metabolic biomarkers were assessed from fasting venous blood samples. Dietary patterns were extracted from dietary intake data obtained from a Food Frequency Questionnaire. Analyses were adjusted for confounders of age and total energy intake. **Results:** PA guidelines (≥ 150 min/week moderate intensity PA) were achieved by 66% of participants. Those meeting PA guidelines had significantly lower total and regional fat mass and percentages ($p \leq 0.001$), BMI ($p = 0.002$), insulin ($p < 0.001$), glucose ($p = 0.029$), total cholesterol ($p < 0.001$) and triglycerides ($p = 0.002$), and significantly higher HDL-c ($p < 0.001$) compared to participants not meeting PA guidelines. Scores for the dietary patterns 'sweet and savoury snacking', 'fruit and vegetable' and 'fats and meats' did not differ between those who did and did not meet PA guidelines, however scores for the 'refined and processed' dietary pattern were significantly lower ($p < 0.001$) among participants meeting PA guidelines compared to those not meeting the guidelines. **Conclusion:** Adherence to basic physical activity guidelines has the potential to significantly improve the long-term metabolic health prospects of women. Promotion of physically active lifestyles, combined with healthy eating behaviours should be a priority in public health messaging.

27. Possible Mechanisms of the Prevention of Mesotrione-Induced Toxicity by Traumatic Acid–Antioxidant and Anticancer Nutrient

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There is a pressing need to develop our knowledge regarding interactions of food contaminants and food components both *in vitro* and *in vivo*. Pesticides belong to the group of highly undesirable food contaminants, and traumatic acid (TA) falls into category of beneficial food ingredients. Previous works from our laboratory have shown that TA acts as an antioxidant *in vitro* in normal human fibroblast cells and, on the other hand, it acts as a prooxidant in cancer cells. Due to the fact that there is the strong connection between the consumption of food contaminated with pesticides and the occurrence of cancer, we decided to study if TA may act as a food ingredient which delays the stimulatory effect of pesticides on breast cancer cell growth and development. To analyze the potential effects that mesotrione may have upon cancerous cells, we conducted studies of the cytotoxicity of physiological concentrations of pesticide and the mix of TA with tested herbicide in ZR-75-1 breast cancer cell line commonly utilized in breast cancer research. The aim of this work was to evaluate the influence of TA combined with mesotrione on the oxidative stress parameters in the ZR-75-1 cells. We also wanted to examine proapoptotic activity of TA in ZR-75-1 cells treated with selected concentrations of mesotrione. Results obtained from the combination of mesotrione with TA revealed that TA exhibits anticancer activity against mesotrione-induced breast cancer development by increasing oxidative stress levels and by stimulating apoptosis. The present finding may indicate that TA may serve as prooxidative and proapoptotic agent, active against mesotrione-induced breast cancer growth and development. This will help in answering the question of whether exposure to selected herbicides is potentially dangerous for women diagnosed with breast cancer and if TA is a food ingredient which may delay the stimulatory effect of herbicides on cancerogenesis.

28. Prevention of Obesity and Chronic Disease through the Expanded Food and Nutrition Education Program in Connecticut, a Peer Education Program Supported by the United States Department of Agriculture

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The University of Connecticut (UConn) faculty and staff in the Expanded Food and Nutrition Education Program (EFNEP) work with colleagues in the College of Agriculture, Health, and Natural Resources and statewide partners in Connecticut on research and scholarship projects. The program utilizes a peer education model to help low-income families to improve four core areas: diet quality and physical activity, food resource management (shopping/preparation on a budget), food safety, and food security. UConn EFNEP has identified four behaviorally focused goals to improve the health and food security of families in the state of Connecticut: decrease sugar and solid fat intakes, increase whole grain consumption, improve food resource management practices, and increase physical activity. The peer educators in EFNEP typically live in the communities where they work and have worked through the same barriers faced by participants. Our skilled educators engage participants by making learning fun and meaningful. Each EFNEP participant attends at least four interactive, hands-on workshops. Learning activities involve food preparation and tasting to help participants to discover new foods. Evaluation data from 2018 indicate the following: 92% of adults improved nutrition practices, 75% of youth increased knowledge or ability to choose healthy foods, 80% of adults improved food resource management practices, 56% of youth increased knowledge or ability to prepare low-cost, nutritious foods, 71% of adults improved food safety practices, 48% of youth improved food safety and preparation knowledge or practices, 54% of adults increased their physical activity by 30 minutes or more, and 43% of youth increased physical activity knowledge or practices. An innovative collaboration with partners on a multi-use trail research team has been planned to increase physical activity through use of natural outdoor resources throughout the state.

29. Regular Consumption of Lipigo® Promotes the Reduction of Body Weight and Improves the Rebound Effect of Obese People Undergo in a Comprehensive Weight Loss Program

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Background: Obesity is a global public health problem. Objective: To evaluate the effect of the regular consumption of the product Lipigo® on body weight and rebound effect on overweight/obese subjects undergoing a comprehensive weight loss program. **Methods:** A randomized, parallel, double-blind, placebo-controlled clinical trial was conducted with both gender subjects presenting a BMI 25–39.9 kg/m². All subjects underwent a comprehensive weight loss program (WLP) for 12 weeks, which included an individualized hypocaloric diet, physical activity recommendations, nutritional education seminars, and three times a day consumption of the product Lipigo® or placebo. After-WLP, subjects continued the treatment for 9 months to evaluate the rebound effect. At the beginning and the end of the WLP, and in the follow-up, body weight (BW), BMI, and body composition were measured. **Results:** A total of 120 subjects (85% women) 49.0 ± 9.5 years old and with a BW of 81.57 ± 13.26 kg (BMI 31.19 ± 3.44 kg/m²) were randomized. A total of 73 subjects finished the study. At the end of the WLP, there was a tendency toward reduced BW, BMI, and BC in the treated group ($p < 0.1$; data not shown). However, subjects with obesity type 1 (OB1) from the treated group significantly reduced body weight (-5.27 ± 2.75 vs. -3.08 ± 1.73 kg; $p < 0.05$) and BMI (-1.99 ± 1.08 vs. -1.09 ± 0.55 kg/m²; $p < 0.01$) compared with placebo. They also presented a minor rebound effect after 9 months with product consumption (-4.19 ± 3.61 vs. -1.44 ± 2.51 kg; $p < 0.05$), minor BMI (-1.60 ± 1.43 vs. -0.52 ± 0.96 kg/m²; $p < 0.05$) and tended to have less fat-mass (-3.44 ± 2.46 vs. -1.44 ± 3.29 kg; $p < 0.1$) compared with placebo. **Conclusions:** The regular consumption of the product Lipigo® promotes the reduction of body weight and improves the rebound effect of obese people, mainly in obesity type 1, who undergo a comprehensive weight loss program.

30. Rice Bran Hydrolysates Inhibit Cell Adhesion to HUVECs and Inflammation through the AMPK-mTOR Pathway

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Leucocyte adhesion to endothelium as well as the interaction of cells with the extracellular matrix are key phenomena in various pathological conditions, such as lymphocyte homing, immune response, and inflammation. Rice bran hydrolysates (RBH) from Thai Tubtim-Chumpae rice (RD69) have shown several pharmacological activities, including antihypertensive, anti-inflammatory, and antidiabetic effects. However, there are limited studies of the immunomodulatory effect of RBH. Monocytes, THP1, and Jurkat T cells were used as models in studies. RBH was prepared from heat-stabilized and defatted rice bran followed by enzymatic hydrolysis. THP1 and Jurkat cells were incubated with RBH before being subjected to migration through the transwell chamber. RBH inhibited the migration of both cells in a dose-dependent fashion. RBH also suppressed adhesion of THP1 cells on cultured HUVEC cells activated by lipopolysaccharide. The effects may be associated with increased activation of AMPK and suppression of mTOR, VCAM1, and NF- κ B. It was concluded that RBH showed the immunomodulatory effect on monocytes and T-lymphocytes through the suppression of chemotaxis and cell adhesion. Consumption of rice bran may provide health benefits on the alleviation of allergic reactions. This work is supported by Bureau of Rice Research & Development, Thailand and Grant-in-aid from Faculty of Medicine, Khon Kaen University, Thailand.

31. Soluble Whey Protein Hydrolysate Attenuates Muscle Atrophy Induced by Hindlimb Immobilization in Mice

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Sarcopenia, the decline of skeletal muscle tissue with age, is one of the most important causes of functional decline and loss of independence in older adults. In this study, after 1 week of hindlimb immobilization (IM) to induce muscle atrophy, we investigated and compared the effect of whey protein hydrolysate (WPH) on muscle atrophy in hindlimb immobilized C57BL/6 mice for an additional 2 weeks with continuous IM. Mice were orally administrated with four types of WPHs (AW-H, whey acidic protein hydrolysate; AW-S, soluble whey acidic protein hydrolysate; WP-H, whey protein hydrolysate; WP-S, soluble whey protein hydrolysate) at a dose of 800 mg/kg/day. We found that grip strength and muscle mass were significantly increased in the WP-S group (WP-S >> AW-H ≥ WP-H = AW-S). Further, the muscle cross-sectional area (CSA) and the distribution of muscle fiber sizes were significantly recovered in the WP-S group (WP-S > AW-H > WP-H = AW-S). The expression levels of protein degradation-associated genes and proteins (Atrogin-1, MurF1, LC3, and Bnip3) were significantly decreased in the WP-S group. The phosphorylation ratio of protein synthesis-associated proteins (PI3K, Akt, 4E-BP1, and S6K1) was significantly increased in the AW-S and WP-S groups (WP-S > AW-S). Collectively, these findings suggest that WPHs attenuate muscle atrophy by inhibiting protein degradation and activating protein synthesis through the PI3K-Akt pathway. Additionally, among the four types of WPHs, WP-S showed a significant protective effect on hindlimb immobilization-induced muscle atrophy.

32. Supplementation with Hydroxytyrosol and Punicalagin Improves Early Atherosclerosis Markers Involved in the Asymptomatic Phase of Atherosclerosis in the Adult Population

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Introduction: Hydroxytyrosol (HT) and Punicalagin (PC) could exert cardioprotective effects in humans. **Design and Results:** A randomized, double-blinded, placebo-controlled, crossover trial was performed for 20 weeks (Age 53.0 ± 4.5 years old, BMI 24.6 ± 3.1 kg/m²). There were two treatment sequences (Placebo/SAX, $n = 41$; SAX/Placebo, $n = 43$) and two intervention periods (Placebo and SAX) 8 weeks long, followed by 4 weeks washout period. Supplement was composed of 9.9 mg/day of HT (Mediteanox[®]) and 195 mg/day of PC (Pomanox[®]); placebo was maltodextrin. SAX increased endothelial function (Flow-mediated dilatation (FMD) from 6.57 ± 2.9 to 8.93 ± 3.8 ($p < 0.001$)). SAX improved the endothelial function in the endothelial dysfunction subgroup (2.36 ± 3.9 vs. $0.76 \pm 3.5\%$; $p < 0.05$) and reduced oxLDL in subjects with higher levels of oxLDL (-28.74 ± 40.2 vs. 25.64 ± 93.8 ng/mL; $p < 0.001$) compared with placebo. After SAX treatment, subjects with systolic prehypertension or hypertension significantly reduced systolic blood pressure (SBP) compared with placebo (-15.75 ± 9.9 vs. -2.67 ± 12.0 mmHg; $p < 0.05$). In addition, SAX treatment significantly decreased diastolic blood pressure (DBP) in the subgroup with diastolic prehypertension and hypertension (from 84.4 ± 6.5 to 78.04 ± 10.8 mmHg; $p < 0.001$). **Conclusion:** The consumption of an oral supplement containing HT and PC (9.9 mg of HT and 195 mg of PC per day) for 8 weeks could help to improve CV health, reducing c-LDL oxidation and improving SBP, DBP, and FMD in middle-aged subjects, especially when these subjects show alterations in these atherosclerotic markers. Therefore, the regular intake of an oral supplement containing HT and PC may reduce CV risk in these subjects.

33. The Combination Effect of Rooibos Compounds to Ameliorate Hyperglycemia-Induced Cardiac Damage In Vitro

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Recent studies have demonstrated that rooibos compounds, aspalathin and phenylpyruvic acid-2-O- β -D-glucoside (PPAG), can independently ameliorate hyperglycemia-associated complications. Aspalathin can enhance intracellular antioxidant defences, while PPAG lacks these capabilities but acts more as an anti-apoptotic agent. Therefore, to better understand the protective properties of these compounds against hyperglycemia-induced cardiac damage, their combination effect in comparison to metformin was explored. An in vitro model of H9c2 cardiomyocytes exposed to high glucose concentrations was used to study hyperglycemia-induced cardiac damage. High glucose exposure impaired myocardial substrate utilization by peculiarly increasing oxidation of free fatty acids while reducing that of glucose, and this was supplemented by altered expression of genes involved in energy metabolism, such as Acetyl-CoA carboxylase (ACC), AMP-activated protein kinase (AMPK), and peroxisome proliferator-activated receptor alpha (PPAR α). In addition to improving myocardial substrate metabolism, the combination treatment performed consistently with metformin in preserving mitochondrial membrane potential and decreasing markers for oxidative stress, such as reactive oxygen species, NADPH oxidase activity, and glutathione content. An even better effect than metformin of the combination was demonstrated in ameliorating DNA damage. Overall, the current results support further exploration of rooibos compounds, including different combinations to understand mechanisms linked with protection against diabetes-associated complications. This is especially important for long-term protection against diabetes-induced cardiac damage.

34. The Presence of BCAT (rs11548193) and BCKDH (rs45500792) Polymorphism Is Associated with Higher Body Mass Index, Blood Pressure, Glucose, Triglycerides, and Leptin in Adults

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An increase in plasma branched-chain amino acids (BCAA) is associated with a 5-fold higher risk for development of type 2 diabetes. BCAAs are catabolized by the branched-chain aminotransferase (BCAT) and the branched-chain ketoacid dehydrogenase (BCKDH). However, little is known about the effect of genetic variation in these enzymes on biochemical parameters related to insulin resistance and metabolic syndrome. Thus, the aim of this study was to evaluate the frequency of the *BCAT* (rs11548193) and *BCKDH* polymorphism (rs45500792) and its association with clinical, anthropometric, and biochemical parameters in adults. We performed an observational, transversal, and comparative study including 1616 adults that provided a blood sample for DNA extraction and biochemical analysis. In addition, we obtained a clinical history and evaluated food intake habits. The polymorphism was determined by allelic discrimination using real-time PCR. The frequency for the noncommon allele for *BCAT2* was 8% and for *BCKDH* 5%. Subjects with the *BCKDH* polymorphism had higher BMI and protein intake ($p < 0.05$), and subjects with both polymorphisms had higher body weight, BMI, systolic and diastolic blood pressure, glucose, triglycerides, and leptin between both genotypes ($p < 0.05$). The presence of *BCAT* and *BCKDH* polymorphism rs45500792 is associated with higher insulin levels and HOMA-IR in young adults. Thus, the presence of both *BCAT* (rs11548193) and *BCKDH* (rs45500792) polymorphism is associated with an increase of biochemical parameters associated with metabolic syndrome.

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35. Use of Microencapsulation of Aromatic Plants and Spices as a Strategy for Salt Reduction for Food and Cooking

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Excessive salt intake has a strong impact as a risk factor for cardiovascular diseases, with prevalence and high impact in Portugal and around the world. Currently, there is extensive scientific evidence supporting the need for salt reduction in food. At the same time, there is a lack of concrete strategies to reduce the use of salt in food establishments. Thus, this project aimed at the development and application of microencapsulation of aromas of aromatic plants and spices to use in culinary preparations. Mixtures of aromatic plants and spices, powdered, were created. From these mixtures, we developed extracts of plant aromas that were microencapsulated, with different encapsulants, to protect and increase aroma and flavor stability. Maltodextrin and inulin were the encapsulating agents which showed the best results with the closest aromatic characteristics of the seasoning with salt. Inulin was selected to develop the final microencapsulation using spray drying and lyophilization techniques. In the culinary preparations, the salt used was replaced from 50% to 80% by the microencapsulate. The sensorial evaluation included color, texture, aroma, taste, and perception of salt. The developed solution presents high stability to use at cooking temperature. Its spherical and dry presentation allowed simulating the use of common salt, combined with its immediate and total dissolution. In addition, the color of culinary preparations remained unchanged, which is not usually the case with the use of aromatic plants. Results of the sensorial evaluation evidenced good acceptance for all parameters, in which salt perception, flavor, and hedonic evaluation stand out. This product can be used as a concrete strategy for salt reduction in public catering and within individual context. The concentration of taste and aroma of this product allows its use either in a gradual reduction or for total salt elimination.

36. Zinc Nutritional Status in Undernutrition Children

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Background: Zinc is an essential nutrient and its deficiency affects the normal growth and development of human beings. Zinc deficiency is widespread in developing countries. However, its prevalence in undernutrition children in developed countries is unknown. **Objective:** The main aim was to investigate zinc nutritional status by serum zinc concentration (SZC) and dietary zinc intake and their association in those patients. **Methods:** A cross-sectional study was conducted in 13 children (6 females) with undernutrition of unknown cause. Anthropometric measurements and blood analysis were conducted. Hypozincemia was determined by SZC while using atomic absorption spectrophotometry and dietary zinc deficiency (DZD) by prospective 72-h dietary surveys. **Results:** Mean SZC ($82.9 \pm 12.3 \mu\text{g/dL}$) was normal, but dietary zinc intake ($69.4 \pm 36.6\%$ Dietary Reference Intake) was pretty low. One of patients (7.7 %) had hypozincemia and eight (61.5%) had a DZD. The infant with two years had DZD and hypozincemia. A positive and significant association was observed between SZC and serum cholesterol ($r = 0.61$, $p = 0.027$), cardiovascular risk ($r = 0.74$, $p = 0.004$), LDL-C ($r = 0.68$, $p = 0.011$), haemoglobin ($r = 0.61$, $p = 0.025$), and between dietary zinc and lipids ($r = 0.69$, $p = 0.013$), vitamin D ($r = 0.61$, $p = 0.035$), magnesium ($r = 0.60$, $p = 0.040$) intake. **Conclusion:** SZC was associated with the nutritional status, expressed as lipid profile, haemoglobin, and dietary zinc intake with lipid, vitamin D, magnesium intake. Only one infant with hypozincemia had DZD. This situation should alert us to a marginal zinc deficiency and it may explain why there were no more overlapping cases between the two groups. We suggest that probably more than 50% of the cases in this study would be at elevated risk of zinc deficiency and a zinc supplementation may be considered.

37. A Randomized Controlled Pilot Study to Investigate the Effect of a Multispecies Probiotic Formulation and Metformin as Modulators of the Intestinal Microbiome for the Management of Diabetes

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Clinical and scientific evidence suggests that the effectiveness of lifestyle and drug interventions in improving metabolic biomarkers associated with type 2 diabetes mellitus (T2DM) can be significantly shaped by the composition and function of the intestinal bacteria. Potential beneficial shifts in the intestinal microbiota that are skewed towards a more balanced state have been reported to mediate the glucose-lowering effect of the antidiabetic drug, metformin. Live probiotic bacteria have often been attributed to controlling the proliferation of undesirable pathobionts in the intestines while increasing the levels of intestinal commensal bacteria that can benefit the host. The role of probiotics as potential normalizing agents of the intestinal microbiota and secondarily supporting an antidiabetic effect have been posited but as yet still have not been clearly explored. The aim of this pilot study was to investigate the effect of a specifically formulated multispecies probiotic formulation on metabolic and inflammatory markers as well as to assess the impact on the intestinal microbiota in adults diagnosed with prediabetes and early T2DM. In addition, the study evaluated the probiotic formulation's concurrent therapeutic effect on metformin. A randomized controlled pilot study, comprising 60 adults with a BMI ≥ 25 kg/m² and diagnosed with prediabetes or T2DM (within the previous 12 months) were randomized to the multispecies probiotic or placebo for 12 weeks. Analysis of fasting plasma glucose, HbA1c, insulin, lipids, hs-CRP, lipopolysaccharide, zonulin, as well as fecal short chain fatty acids (SCFA) and metagenomic analysis of fecal microbiome were performed at baseline and 12 weeks post-intervention. This presentation will present the results observed and further discuss the effects that a multispecies probiotic formulation had in improving insulin sensitivity by encouraging the intestinal microbiome to increase production of the SCFA butyrate, whilst eliciting a synergistic interaction with metformin.

38. Diet Effect on the Relative Abundance of *A. muciniphila* and Its Relationship with Risk Indicators of Cardiovascular Diseases and Other Bacterial Communities in the Gut Microbiota

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Introduction: Excess body weight (EBW) has been recognized as one of the most important public health challenges. Mexico has reported a 72.5% of EBW prevalence. The gut microbiota has recently aroused a great interest as an important factor involved in the regulation of body weight and metabolic disorders. *Akkermansia muciniphila* abundance has been inversely related to body weight, insulin resistance, and dyslipidemia. **Objective:** The purpose of the present study was to analyze the effect of regional diet on the relative abundance of *A. muciniphila* and the relationship of the bacteria with risk indicators of cardiovascular diseases and other bacterial communities. **Methods:** A cross-sectional study that included 62 young adults of both sexes with a wide range of BMI was performed. A food frequency questionnaire and three 24-h dietary recalls were applied. Anthropometric measurements were evaluated with standardized methodologies. TC, HDL, LDL, TAG, and glucose were measured from peripheral blood samples, and the gut microbiota composition was analyzed in fecal samples by massive sequencing of 16S rRNA genes V3 region. **Results:** *A. muciniphila* was identified in 43.2% of the subjects, with a relative abundance of 0.028% (0.14–0.9). Carrier subjects were compared with noncarriers. The diet of the groups was similar; no differences were observed in nutrients intake or polyphenols intake. No differences were found in the biochemical or anthropometric variables. Subjects with *A. muciniphila* have a greater presence of the families Ruminococcaceae, Saccharimonas, and Desulfovibrionaceae and smaller abundance of the Erysipelotrichaceae family and of the genera *Romboutsia*, *Olsenella* and *Megasphaera*. **Conclusion:** The presence and abundance of *A. muciniphila* are lower than the reported in other populations. Apparently, no dietary components were identified in the diet that could increase *A. muciniphila* presence or results that suggest its participation in weight regulation or metabolic control. A relationship with other bacterial communities has been observed.

39. In Vitro Effects of Two Casein Hydrolysates on Selected Fecal Bacterial Populations of Weaned Piglets

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A stable and diverse microbiota beneficially influences host health and growth. A 5 kDa retentate (5 kDaR) of a bovine casein hydrolysate (CH) reduced inflammation in in vitro and ex vivo models and improved the intestinal response of pigs to weaning. The objective of this study was to determine if these casein hydrolysates would alter the composition of the fecal microbiota of weaned piglets in an in vitro batch fermentation system. The CH and 5 kDaR were produced from the hydrolysis of sodium caseinate ($\approx 90\%$ w/w protein) and were used at 5, 2.5, and 1 mg/mL concentrations. Diluted pooled faeces from newly-weaned piglets (1:5 w/v) were added to the fermentation medium (1:10 v/v). Controls with no hydrolysate were included. The incubation conditions were 39 °C for 24 h at 100 rpm with sampling at 0, 10, and 24 h. After centrifugation, the pellets were used for bacterial DNA extraction. Experiments were replicated in triplicate. The log gene copy number (logGCN)/g digesta of total bacteria, lactobacilli, bifidobacteria, *Enterobacteriaceae*, and *Prevotella* spp. were determined by quantitative PCR. The data were analysed by repeated-measures using PROC MIXED (SAS 9.4). Total bacteria were increased at 5 mg/mL 5 kDaR ($p < 0.05$) compared to control, whereas CH had no effect. Both hydrolysates increased lactobacilli; CH at 2.5 mg/mL and 5 mg/mL ($p < 0.05$) and 5 kDaR at 5 mg/mL ($p < 0.05$) compared to the control. Bifidobacteria were decreased at 5 mg/mL CH ($p < 0.05$) but increased at all 5 kDaR concentrations tested ($p < 0.05$) compared to the control. *Prevotella* spp. and *Enterobacteriaceae* were increased at 2.5 mg/mL CH and 5 mg/mL 5 kDaR compared to the control ($p < 0.05$). In conclusion, the 5 kDaR consistently increased all beneficial bacteria tested in vitro indicating its potential to support a healthy microbiota during the weaning period in pigs.

40. Integrative Analysis of Human and Food Microbiome Data in Knomics-Biota Platform

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Microbial communities play important role in human life. The intake of fermented and probiotic products modulates host health and its associated microbiome. Metagenomic essays allow to get insight into microbial populations dynamics in each of them. Here we show cases how an online system for interactive exploratory analysis of human microbiome data can be diversified to analyze yeast and bacterial sequencing data related to food microbial consortia giving a powerful tool for verifying products benefits claims and quality control. The system allows to analyze yeast populations via support of ITS amplicon sequencing data which is applicable to fermented food like kefir and beer; to perform statistical and visual analysis of data obtained in placebo-controlled clinical trials of dietary interventions; to compare one's own experimental data in the context of publicly available metagenomes; to explore relative abundance of starter culture and probiotic microbes in dairy products at the maximum resolution provided by the 16S rRNA amplicon sequencing format.

41. Presence of Endotoxins, Bacteria, and Bacterial Toxins in Commercially Available Infant Cereals

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Background: Endotoxins may cause intestinal inflammation and increase permeability in infants and have previously been found in both cereals and infant formula. Infant cereal-based foods may contribute to a large proportion of the overall diet of a young child. This study analyzed the presence of endotoxin, microbes, and their toxins in commercial infant cereals. **Methods:** Four porridges and six milk cereal drinks were bought in Sweden, including seven types of cereals and recommended for children between 4 and 12 months of age. The products were analyzed for water activity and the presence of endotoxins, viable bacteria, enterotoxin-producing genes, as well as levels of mycotoxins. **Results and Discussion:** The endotoxin concentration in the products ranged from 1400 EU/g to 24,200 EU/g powder and most likely originated from gram-negative bacterial residues. Despite a low water activity in the powders, live bacteria were detected in all products, and the most abundant was *Bacillus* spp. Genes coding for the enterotoxins NheA and CytK were found in two of the products. These results indicate that it is possible for potentially harmful bacteria to survive industrial processing to prepared products. The levels of mycotoxins found were below the detection limit and followed the regulations. **Conclusion:** This study indicates that active and potentially harmful microbes, bacterial residues, and their toxins are present in powdered infant cereal-based foods.

42. The Composition of Gut Microbiota in Obese and Normal-Weight Korean Young Children

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Objectives: Studies on obesity-related gut microbiota in young children are scarce, although the gut microbiota in adult has been extensively studied. The association between the Firmicutes to Bacteroidetes (F/B) ratio and body mass index (BMI) has shown inconsistent results in studies of children. The object of this study was to characterize the composition of gut microbiota in obese and normal-weight Korean children. **Methods:** Fecal samples were collected from obese (BMI \geq 97th percentile) and normal-weight (BMI 85 BMI percentile) Korean children aged 5–13 years from December 2017 to March 2018 and subjected to 16S rRNA gene sequencing using the Miseq platform (Illumina, San Diego, CA, USA). **Results:** A total of 46 children, including 22 obese (8.1 ± 1.5 years old, male 75%) and 24 normal-weight (9 ± 1.5 years old, male 68.2%) children, were enrolled. The comparison of gut microbiota richness and evenness indexes between two groups showed no obvious differences ($p > 0.05$). The beta diversity using a Fast UniFrac and Bray–Curtis analysis showed significant differences between obese and normal-weight children ($p < 0.05$). At the phylum level, the predominant bacterial taxa were *Bacteroidetes* and *Firmicutes*, followed by *Actinobacteria* and *Proteobacteria* in both groups. The intestinal microbiota of obese children was not significantly enriched in *Firmicutes* (obese: median 53.1 [45.1; 73.3], normal: 45.7 [24.7; 76.6]) ($p > 0.05$). The relative abundance of *Bacteroidetes* was significantly increased in normal-weight children (obese: 36.6 [0.3; 52.9], normal: 45.2 [10.5; 69.1]) ($p < 0.05$) and was negatively correlated with BMI-z score ($p < 0.05$). The F/B ratio was significantly elevated in obese children (obese: 1.5 [0.9; 18.4], normal-weight: 1.1 [0.4; 2.9]) ($p < 0.05$). Receiver operating characteristic curve analysis of *Bacteroidetes* for predicting obesity showed good performance (area under curve (AUC): 0.7, 95% CI 0.6–0.9), unlike in *Firmicutes* (AUC: 0.5, 95% CI 0.4–0.7) ($p < 0.05$). **Conclusion:** Gut microbial composition is known to vary with age and ethnicity. This study showed valuable information on obesity-related microbiota in Korean young children.

43. Variation of Microbiome Response to the Dietary Interventions: General and Intervention-Specific Microbial Signatures of Responders

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Methods of modulating the intestinal microbial community, in particular, prebiotics and probiotics intake, are a promising approach to the prevention and treatment of diseases. However, recent studies have shown that the response of the microbial community to the intervention can vary widely between individuals. In this study, changes in the gut microbiome composition after two different interventions were analyzed: a high-fiber diet intervention and intake of fermented dairy product fortified with probiotic bacteria. In each cohort, the response to intervention varied between individuals and the degree of response turned out to be effectively predicted by the microbiota composition at the baseline. The microbiota of individuals with a greater degree of response (responders) has been compared between the two interventions. The two groups of responders had partly intersecting microbial signatures: Both were characterized by the higher relative abundance of the Bacteroides-dominant bacteria cluster and lower abundance of the Lachnospiraceae-dominant cluster. At the same time, there were differences: In particular, the high-fiber diet intervention responders group had a lower abundance of polysaccharide degraders from Firmicutes phylum (Eubacterium, Ruminococcus), while probiotic intervention responders had a lower abundance of some lactose-degrading bacteria (Lactococcus, Streptococcaceae). Thus, for the investigated interventions, the signature of the responders can be considered as partially intervention-specific.

44. Beneficial Effects of Saffron Intake on the State of Mind in Multiple Sclerosis Patients

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INTRODUCTION: Multiple Sclerosis (MS) is a chronic disease of the central nervous system (CNS) and the second leading cause of disability in young adults. MS causes serious physical, psychological, and social sequels on patients. Depression and anxiety are comorbidities highly prevalent in these patients, with an important impact on quality of life and interpersonal relationships. Saffron (*Crocus sativus* L.) is one of the most popular spices in the world because of its color, flavor, and flavoring properties. Aside from its culinary value, saffron has been traditionally used as a medical plant for the antioxidant properties of its main bioactive compounds: crocins, picrocrocin, and safranal. There is strong evidence of the antidepressant and modulating mood action of saffron. The aim of this study was to assess the effect of the intake of an infusion of saffron in order to achieve an improvement in quality of life of MS patients. **METHODS:** The most appropriate way for preparing the infusion of saffron was studied considering the kinetics of bioactive metabolites extraction and their stability. A total of 24 MS patients took saffron infusion for 93 days. To measure health-related quality of life in MS, the specific Multiple Sclerosis Quality of Life-54 (MSQOL-54) questionnaire was used. **RESULTS:** The results showed that the quality of life related to health improved significantly ($p < 0.007$), decreasing the perception of these patients of depression or anxiety, improving their social relationships ($p = 0.041$) and satisfaction with their sexuality ($p = 0.001$). **CONCLUSION:** Saffron intake improved state of mind, reducing anxiety and depression in MS patients. Further studies are needed to confirm these findings, offering a natural alternative to standard treatments.

45. Bioactive Compounds in Sweet Cherries: 24 Months Post-Harvest, Is There Anything Left? *

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** Selected Poster for the Best Poster Award*

Sweet and sour cherry varieties provide a rich dietary source of anthocyanin, a bioactive compound with demonstrated health benefits. Global cherry production is estimated to be in excess of 3.7 million tonnes annually. However, the growing season is short, with consumers relying on frozen fruit for up to 9 months of the year. The aim of this research was to ascertain the impact of storage conditions on residual anthocyanin content. Cherries were harvested at commercial maturity across three growing seasons from 2014–2017 and, after grading, were stored at either $-20\text{ }^{\circ}\text{C}$ or $-80\text{ }^{\circ}\text{C}$. At 0, 3, 6, 12 and 24 months post-harvest, anthocyanins were extracted, and total anthocyanin content (TAC) and profile were determined via ultra-performance liquid chromatography (UPLC). There was a precipitous decline in the TAC of cherries stored at $-20\text{ }^{\circ}\text{C}$, with levels dropping by 54.6% after 3 months, with as little as 4.4% of TAC remaining at 24 months. In contrast, TAC of cherries stored at $-80\text{ }^{\circ}\text{C}$ decreased by only 27% following 3 months of storage and interestingly showed a return to 99% of fresh TAC at the 12-month time point. This suggests that for preservation of anthocyanins, storage at $-80\text{ }^{\circ}\text{C}$ for a maximum of 12 months is optimum. However, the challenge remains for the fruit industry as to how best to preserve the bioactive profile of fruit with commercial quantities. It also raises the question as to whether long-term freezer storage is appropriate or if other storage options should be explored.

46. BIOPEP-UWM Database, a Source of Information Concerning Food Peptides and Proteins—New Options

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** Selected Poster for the Best Poster Award*

Peptides affect the biological, functional, and sensory properties of foods. The BIOPEP-UWM database has been designed mainly for scientists working in the area of food and nutrition. The aim of the presented work was to provide new opportunities for calculation of quantitative parameters characterizing the content of bioactive fragments in protein chain, parameters characterizing possibility of release of such fragments by proteolytic enzymes, and new search options. In silico analyses can be performed using the BIOPEP-UWM database of bioactive and sensory peptides and BIOPEP-UWM-associated tools (<http://www.uwm.edu.pl/biochemia/index.php/pl/biopep>). New options include batch processing, enabling the processing of up to 30 protein or peptide sequences, submitted in FASTA format. Batch processing involves profiles of potential biological or sensory activity of proteins, proteolysis simulation, searching for active fragments among predicted products of proteolysis, and calculation of quantitative parameters characterizing proteolysis. Information concerning the specificity of proteases was updated to include recent specificity matrices provided in the MEROPS database and proteolytic events, summarized in the CutDB database. The new search possibilities include an “exact match” option, enabling finding peptide identical with a query sequence and searching based on InChIKey. The last one is a unique code designed for description of chemical compounds. INChIKey always contains 27 characters and may be used to search via Google™ or specialized programs, such as Chemical Translation Service. InChIKeys and other chemical codes (SMILES, InChI) are introduced to enhance the compatibility of BIOPEP-UWM with databases and programs from the area of chemical informatics. Our intention is to establish BIOPEP-UWM as a database integrating information about the properties of food peptides. It can support experimental and theoretical studies in the abovementioned approaches.

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47. Cocoa Intake Is Associated with Reduced Odds of Advanced Liver Fibrosis in Patients Co-Infected with HIV and Hepatitis C Virus (ANRS CO13 HEPAVIH)

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The benefits of polyphenol-rich foods on inflammation and liver function are an area of growing research interest. Daily chocolate intake is significantly associated with reduced levels of liver enzymes in patients co-infected with HIV and hepatitis C virus (HCV). This study aimed to analyze the relationships between cocoa intake and advanced liver fibrosis in this population with chronic liver disease. Analyses were based on longitudinal clinical (medical records) and sociobehavioral (self-administered questionnaires) data collected between 2005 and 2014, during annual follow-up visits of 1015 participants in the French ANRS CO13 HEPAVIH prospective cohort of HIV–HCV co-infected patients. We used mixed-effects logistic regression models to analyze the relationships between cocoa intake, assessed through chocolate intake during the six months preceding each visit (no, occasional (once a week or less, several times per week), and daily intake (one to several times per day)) and advanced liver fibrosis (FIB-4 index > 3.25). At the last visit with a completed questionnaire, 13.5%, 73.4%, and 13.1% of patients reported, respectively, no, occasional, and daily cocoa intake during the previous six months. At the same visit, 16.6% of patients had advanced liver fibrosis. After multivariable adjustment for gender, and time-dependent variables including age, body mass index, HCV cure, plasma HIV viral load, and coffee and alcohol consumption, occasional and daily cocoa intake were significantly associated with, respectively, 64% (adjusted odds ratio (95% confidence interval): 0.36 [0.19; 0.68]) and 81% (0.19 [0.08; 0.47]) reduced odds of advanced liver fibrosis (versus no intake). In HIV-HCV co-infected patients, cocoa intake is independently associated with reduced odds of advanced liver fibrosis, a marker of higher risk of morbi-mortality in this population. Further research is needed to identify the components of cocoa involved in this protective relationship.

48. Effect of Shiitake Extract on Lipid Profile in Subjects with Moderate Hyperlipidemia and without Pharmacological Treatment

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Background: Oat beta-glucan has been shown to reduce blood cholesterol.

Objective: To evaluate the effect of regular consumption of shiitake extract in the lipid profile of subjects with moderate hyperlipidemia and without pharmacological treatment. **Design:** A randomized, parallel double-blinded, placebo-controlled trial was performed for 8 weeks. Subjects were randomized into two study groups: placebo (PG; $n = 24$) and food supplement of shiitake fungus extract (ShG; $n = 28$). Both groups followed healthy eating guidelines and took the treatment assigned daily with 200 mL of soup. Supplement was composed of 3.5 mg/day of beta-glucans, and placebo was maltodextrin. At the beginning and at the end of the study, the blood lipid profile was measured and diet registered. **Results:** A total of 58 subjects of 51 ± 6.5 years old and with a BMI of 26.0 kg/m^2 finished the study. At the beginning of the study, there were no differences between treatments in blood and dietetic variables. At the end of the trial, there were no differences in blood lipid profile between PG and ShG (cholesterol (0.67 ± 26.41 vs. 0.68 ± 27.99 mg/dL); HDL (1.29 ± 7.82 vs. -1.11 ± 7.61 mg/dL); LDL (0.54 ± 28.35 vs. 3.18 ± 25.03 mg/dL); and triglycerides (2.83 ± 42 , vs. -9.79 ± 65.47 mg/dL)). Even though dietary cholesterol was similar between groups (-38.4 ± 234.7 vs. 21.3 ± 129.2 mg/dL), some dietary lipids were higher in ShG (lipids (-16.5 ± 34 vs. 3.1 ± 31.1 ; $p < 0.05$) and SFA (-7.8 ± 12.8 vs. 2.7 ± 15.7 ; $p < 0.05$)) than in PG. Dietary fibre consumption was higher in ShG (-3 ± 8.2 vs. 3.1 ± 7.7 g; $p < 0.05$). **Conclusions:** The regular consumption of a food supplement of shiitake fungus extract could help to avoid increasing the blood cholesterol of subjects with moderate hyperlipidemia and without pharmacological treatment who do not follow a healthy eating guideline properly.

49. Effects of a Diet Containing Defatted Mealworms (*Tenebrio molitor*) in Spontaneously Hypertensive Rats

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Edible insects were proposed as a novel functional food as they possess antitumor, antiobesity, antimicrobial, antioxidant, and antihypertensive activities. For example, the protein fraction arising from gastrointestinal or alcalase enzymatic hydrolysis of mealworms, the larval stages of *Tenebrio molitor* (Coleoptera Tenebrionidae), showed interesting ACE inhibitory activity. Hypertension being one of the main risk factors for human health, the effects of the protein obtained from mealworms (TM) were investigated in spontaneously hypertensive rats (SHR) or in the normotensive matched strain (Wistar Kyoto, WKY). The ACE inhibitor captopril was used as a positive control. Results clearly showed that a diet containing a 4.5% of protein derived from TM exerts antihypertensive, cardio-, and neuroprotective effects along with a mild hypoglycemic activity. Considering that TM inhibits intrinsic blood coagulation pathways and possesses antiobesity activity, it can be considered a multitarget functional food. Furthermore, since some of its effects are not shared by captopril, TM could offer added value in preventing hypertension and would lay the foundations for a pharmacological characterization of TM bioactive peptide components in pre-hypertension treatment.

50. Efficiency of Different Cholecalciferol Formulations in Treating Suboptimal Vitamin D Status

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Introduction: Vitamin D (VitD) has a critical role in the phosphorous–calcium metabolism as well as an important role in the immune system. In the human body, vitamin D is synthesized as cholecalciferol in the skin, but this process requires sunlight (UVB) radiation. Numerous reports showed high prevalence of low VitD intake and VitD deficiency in Europe—particularly during the winter season, indicating the importance of VitD supplementation. Various factors can affect the absorption of vitamin D, including dosage and formulation. **Goal:** To investigate efficiency of two months of treatment using 1000 IU of vitamin D3 per day using three different VitD formulations on human subjects with suboptimal Vitamin D status. **Method:** A randomized controlled intervention study was conducted on 105 subjects (aged 18–65 years) with suboptimal vitamin D status (12–20 mcg/L). Subjects were randomized into four groups—a control group which did not receive supplemental Vitamin D, and three treatment groups, receiving (A) oil-based Valens vitamin D oral spray; (B) water-based Valens vitamin D oral spray; or (C) Vitamin D capsules with starch-adsorbed vitamin D. The trial was conducted in Slovenia during winter time; supplementation started in January and ended in March. **Results:** Supplementation with Vitamin D (1000 IU daily) during winter resulted in considerable increase in average serum VitD levels for 13 mg/L (from 15 ± 2 mcg/L to 28 ± 7 mcg/L), while no statistically important differences were observed between the tested formulations. On the other hand, control serum VitD level in the control group was further lowered from January to March. **Conclusions:** All three tested VitD formulations were efficient in improving suboptimal VitD status; however, the dosage of 1000 IU daily might not be sufficient for optimal VitD status during winter months. After 2 months of supplementation, serum VitD levels were still below 30 mcg/L in 77% of the subjects.

51. Evaluation of Antigenotoxic and Anticytotoxic Effect of *Nigella sativa* through Micronuclei Test in Murine

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Introduction: Currently, organic components are used as adjuvants in high toxicity pharmacological treatments, such as chemotherapy. *Nigella sativa* (*N. sativa*), also known as black cumin, is rich in flavonoids, proteins, and minerals, with thymoquinone being the main active component, and with a wide range of therapeutic effects, such as antioxidant, antidiabetic, antineoplastic, and highlighting its cellular protective effect. **Objective:** To evaluate the antigenotoxic and anticytotoxic effect of *N. sativa* using the micronuclei test in mouse peripheral blood. **Material and methods:** Four groups were formed, each with 5 male BALB/c mice, aged 6–8 weeks, average weight 22 g; (1) Control (H₂O), single dose 2 mg/kg/intraperitoneal (i.p.); (2) *N. sativa*, oil 500 mg/kg/24 h/7 days/i.p. (3) Cisplatin (Cis), single dose 2 mg/kg/subcutaneous; and (4) *N. sativa* + Cis with their respectively dosage. A blood sample was taken every 24 h per organism, and smears were fixed (80% ethanol), stained (acridine orange), and analyzed (100×). A total of 10,000 erythrocytes were counted to identify the frequency of micronucleated (EMN) and polychromatic erythrocytes (EPC). Further, 1000 EPCs were counted to identify micronucleated polychromatic erythrocytes (EPCMN). **Results:** Supplementation of *N. sativa* oil does not induce genotoxic damage in this model, based on the frequency of the EMN (biomarker of genotoxicity), which is maintained without statistically significant differences. On the other hand, when evaluating EPC (biomarker of cytotoxicity) *N. sativa* + Cis, 48 h after application, the EPC frequency increased, which shows the recovery of the bone marrow. Finally, the analysis of EPCMN (acute genotoxicity biomarker) shows similarity within the groups except in Cis, but when administered with *N. sativa* + Cis, the frequency of this biomarker was regulated. **Conclusion:** *N. sativa* has a genoprotective effect against toxic stimuli and regulates cell proliferation in murines.

52. From Liability to Possibility: Wine Pomace for the Prevention and Treatment of Glucose Intolerance and NAFLD

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Non-alcoholic fatty liver disease (NAFLD) is a common condition, affecting up to 1/3 of the US population, and is considered as the hepatic manifestation of the metabolic syndrome. While NAFLD represents the more common cause of chronic liver disease, specific therapies are currently not available. Thus, there is a great need for research that will lead to safe and effective treatments for NAFLD. The wine industry is using 80% of the grapes grown worldwide, thus producing millions of tons of residues after fermentation, which represents a waste management issue. The pomace remaining after fermentation still contains high levels of polyphenols and is considered a valuable source of phytochemicals that may be used in the pharmaceutical and food industries. We already demonstrated the preventive effect of pomace against the development of hepatic steatosis in high fat diet (HFD)-fed mice. The aim of this study was to clarify whether pomace might be beneficial not only for prevention, but also for the management of NAFLD at different levels of severity. **Methods:** C57bl/6 mice were given HFD or western diet and fructose for 6 weeks before supplementing the diet with pomace (50–250 mg/day) for additional 6 weeks. Glucose and insulin tolerance tests were performed, serum insulin, ALT and AST were measured, and hepatic triglyceride content was analyzed using biochemical and histological methods. **Results:** No adverse effects were detected in all treatment groups. Pomace improved all parameters measured: body weight gain, glucose tolerance, insulin sensitivity, hepatic TG content, and liver histology. Pomace was more effective in the treatment of hepatic steatosis than in more advanced stages of the disease. **Conclusion:** Pomace might be used as a supplement with beneficial health outcomes. These results encourage further research for the characterization of various pomace sources, and to evaluate their constitution, towards the possible development of a new dietary supplement.

53. Health-Promoting Effects of Broccoli during Storage

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Today, consumers are becoming increasingly concerned about the health benefits of diets rich in bioactive compounds. These compounds are found in vegetables and are synthesized by plants as a defence system against diseases and pests. Many studies have been focused on broccoli (*Brassica oleracea* L.), since it is rich in bioactive compounds (phenolic compounds, flavonoids, carotenoids, and glucosinolates), which are considered beneficial for reducing the risk of chronic diseases such as hypertension, type II diabetes, dyslipidemia, and some types of cancer. From harvest to consumer deliveries, broccoli is stored in refrigeration and temperature conditions, and the relative humidity can lead to a reduction of the total quality of broccoli, including changes in the health-promoting effects related to the content of bioactive compounds. The aim of this work was to evaluate the stability of bioactive compounds of broccoli during refrigerated storage in order to ensure their concentration in the consumer's diet along the product's commercial life. In this study, we selected Broccoli cv. Parthenon, cultivated in Totana (Murcia). Broccoli heads were collected, and after that the samples were stored in a refrigeration camera at 4 °C. Samples were analyzed on the day of harvest (T0) and during storage at the weeks 2, 4, and 5 (T2, T4, and T5). The analyses were carried out to ascertain the quality parameters (color, moisture, chlorophylls), the content of bioactive compounds (total phenolic compounds, total flavonoids, vitamin C, carotenoids, and glucosinolates) and the oxygen radical absorbance capacity (ORAC). Statistical analyses were performed with R, versión 3.4.3 (The R Foundation for Statistical Computing, Vienna, Austria), with the aim to determine significant differences in the analyzed parameters among the four experimental groups.

54. In Vitro Immunomodulatory Properties of Different Peruvian Cocoa populations on Rat Spleen Lymphocytes

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Cocoa tree (*Theobroma cacao* L.) is cultivated under a tropical climate, and the North of Peru and South of Ecuador is considered as the centre of origin and genetic diversity. Geographic factors such as soil, water, cultivation latitude, and management result in a wide range of regional cocoa populations with singular qualities and quantities of bioactive compounds. Cocoa has demonstrated immunomodulatory potential both in vitro and in vivo; however, each population may have different biological effects on the immune system from those reported so far. This study aimed to evaluate the in vitro effect of four Peruvian cocoa populations from different geographical regions (coast and forest) on spleen lymphocyte function. For this purpose, the Peruvian cocoa pastes and a conventional cocoa paste as a reference were ground, dissolved in organic solvent, centrifuged, and filtered in sterility. Afterwards, the total polyphenol content was determined (Folin–Ciocalteu method). In order to evaluate their immunomodulatory properties, spleen lymphocytes were isolated from Brown Norway rats. Cells (1×10^6 /mL) were incubated for 2 h with 10 µg/mL of each cocoa population and stimulated overnight with 100 ng/mL of lipopolysaccharide (LPS). The tumour necrosis factor (TNF) α and interleukin (IL) 10 contents in supernatants were quantified (ELISA). The cocoa populations, showing a polyphenol content ranging from 15 to 26 mg of gallic acid (GA)/g, did not affect lymphocyte viability. "Criollo de Montaña" from Junin (forest) and "Chuncho" from Cusco (forest) populations showed an inhibitory effect on the secretion of both TNF-α (11%–20%) and IL-10 (40%–55%) in LPS-stimulated spleen lymphocytes. The remaining populations had an effect significantly lower. In conclusion, the origin of *Theobroma cacao* L. influences the concentration of cocoa bioactive compounds and their in vitro immunomodulatory properties on lymphocytes.

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55. Milk Protein Consumption for 10 Weeks Elevated Insulin-Stimulated Microvascular Blood Flow in Exercising Men with Type-2 Diabetes

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** Selected Poster for the Best Poster Award*

Introduction: Milk protein supplementation has been shown to accentuate the beneficial effects of exercise on arterial relaxation, a response that is critical to insulin-mediated regulation of blood kinetics and glucose disposal after eating. The purpose of this investigation was to determine if peri-training whey protein supplementation for 10 weeks elevated microvascular blood kinetics in type-2 diabetic skeletal muscle, a site of circulatory dysfunction, and whether improvements were predictive of better glucose disposal rates.

Method: Twenty-four middle-aged men with type-2 diabetes completed 45 intense exercise sessions with a peri-training whey protein–carbohydrate supplement (30/10 g) or isocaloric carbohydrate placebo. Changes in microvascular blood flow (mBF) and blood volume (mBV) during a euglycaemic insulin clamp were assessed by near infrared spectroscopy and regressed against glucose disposal rates. **Results:** Whey protein supplementation produced a possible increase in basal mBF and a likely increase in insulin-stimulated mBF compared to exercise alone. There was no clear evidence of a treatment effect on glucose disposal rate, but regression analysis indicated that increases in both mBF and mBV predicted improvements in glucose disposal rate after whey supplementation but not after exercise alone.

Conclusion: Whey protein supplementation produced clear benefits to microvascular blood flow after 10 weeks of exercise training that may be beneficial to the circulatory regulation of glycaemia in T2D.

56. Effect of a Community-Based Lifestyle Intervention Program on the Blood Plasma Levels of Lipid Peroxidation in a Rural German Population after 10 Weeks of Intensive Intervention

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Lifestyle diseases are linked with hyper-reactivity of inflammatory and immune cells. These cells generate free radicals in the patients, which results in oxidative stress. Recent studies have brought attention to the role of oxidative stress, defined as an imbalance between reactive oxygen species (ROS) and antioxidants. Our research was focused on studying the effects of a community-based lifestyle intervention program on oxidative stress parameters in the plasma of a rural German community. In our study, we examined 105 participants in the intervention group and 70 participants in the control group. The intervention group received 10 weeks of intensive intervention in the form of seminars and workshops. The plasma levels were analyzed at baseline and after 10 weeks of intervention. This is a first-of-its-kind study which elucidates the impact of an intensive lifestyle intervention program on the oxidative stress markers in German rural participants. The primary focus of our study was to motivate and encourage participants to switch over toward a healthier lifestyle by improving their knowledge and making them more aware of the principles of healthy living. This may be a useful community program approach, modifiable for different communities by health-services planners in the coming future.

57. Phenolics and 20-Hydroxyecdysone from the Andean *Prumnopitys andina* (Podocarpaceae) Fruits: Cytoprotective Effect and Inhibition of Meat Lipoperoxidation under Simulated Gastric Digestion

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The fruits from the Chilean Podocarpaceae *Prumnopitys andina* have been appreciated as food since pre-Hispanic times. However, little is known about the composition and biological properties of this species. The aim of this work was to identify the constituents in *P. andina* fruit arils and to assess the antioxidant activity by means of chemical and cell-based assays. The main secondary metabolites from the *P. andina* arils were isolated by countercurrent chromatography and gel permeation. The compounds were identified by spectroscopic and spectrometric means. Minor constituents were identified by HPLC-DAD-MSⁿ and/or co-injection with standards. Some 24 compounds were described in the fruit extract. Rutin, caffeic acid β -glucoside, and 20-hydroxyecdysone were isolated as the main compounds, while orientin and 3-caffeoylquinic acid were identified with commercial standards. In the cell-based assays, a pre-incubation of 16 h with different concentrations of the fruit extract (500–31.3 $\mu\text{g}/\text{mL}$) significantly protected human gastric epithelial (AGS) cells against oxidative and dicarbonyl stress in a concentration-dependent manner. The *P. andina* extract significantly increased the total intracellular antioxidant activity (TAA) and prevented malondialdehyde (MDA) generation and meat lipoperoxidation under simulated gastric digestion conditions. The fruit extract was three times more active than the reference compound aminoguanidine. The antioxidant activity measured by chemical methods (DPPH, TEAC, FRAP, and ORAC) was moderate, comparable to other Podocarpaceae fruits. Our results show the need to use combined assays (cell-based and chemical antioxidant tests) to have an insight into the possible health-beneficial potential of food plants. This is the first report on the composition and biological activity of this Andean fruit. More attention should be given to South American native food species as a source of bioactive phytochemicals.

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58. Potential Prebiotic Effect of Dietary Raspberry in the Management of Obesity

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Dietary fiber and polyphenolic compounds are suggested to modulate selected populations of gut bacteria, which may be associated with changes in metabolic pathways related to obesity and inflammation, conferring benefits upon host health. It is known that gut microbiota produces fermentation products in the large bowel, such as short-chain fatty acids (SCFA), derived from food components that are unabsorbed/undigested in the small intestine. Metabolic SCFA are related to beneficial bacteria growth, inhibition of pathogens, and reduction of metabolic diseases, such as obesity and related disorders. Considering the potential relationship between these fermentation products and human health, the aim of this work was to evaluate the prebiotic effect of raspberry and its extracted fractions (polyphenols, total dietary fiber, soluble dietary fiber, and insoluble dietary fiber), by performing *in vitro* fermentations from human feces collected from 3 overweight women. The prebiotic activity was measured by the evaluation of the formation of main SCFA (acetic, propionic, and butyric acids) as metabolites produced by gut microbiota. A positive control, using glucose as a substrate, and negative control, not including any substrate, were used. The SCFA concentrations were analyzed via gas chromatography after 0, 4, 6, 24, and 48 hours of fermentation. Results showed a general increase of SCFA levels with time, being significantly different among individuals. A higher increase of SCFA was found with raspberry and polyphenols extracts, while total dietary fiber, soluble dietary fiber, and insoluble dietary fiber hardly showed changes in SCFA concentrations. In this work, the prebiotic effect from raspberry fruits may be related to the polyphenolic compounds content, as dietary fiber concentrations could be not enough to produce any effect. Further studies analyzing beneficial bacteria population changes and polyphenol metabolites derived from fermentations would contribute to understanding this prebiotic effect of raspberry polyphenols in the treatment of metabolic diseases.

59. Solid-State Cultured *Antrodia cinnamomea* Ethanol Extract Micro-Nanoparticles Alleviate Reproductive Dysfunction on Diabetic Male Rats

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The high-sugar and high-oil diet has gradually become a habit, which is followed by many metabolic diseases, including diabetic mellitus. Insufficient insulin secretion or insulin resistance is known as the major cause for the diabetic condition. In men, diabetes causes important sexual dysfunction. *Antrodia cinnamomea* (*A. cinnamomea*) contains a large number of complex natural ingredients. The important active ingredient used in this experiment was ubiquinone. In this study, a chitosan-silicate nanoparticle selected as the carrier, to become solid-state cultured *A. cinnamomea* micro-nanoparticles (Nano-SAC). Animal experiments were performed with streptozotocin (35 mg/kg) as a model of diabetes. Groups were divided into a control group, a diabetic group (DM), a positive control group (Metformin, 200 mg/kg), DM + Nano-SAC 1 (4 mg/kg), DM + Nano-SAC 2 (8 mg/kg), DM + Nano-SAC 5 (20 mg/kg), and SAC (20 mg/kg) for five weeks. The results showed that the nanoparticle size was 37.68 ± 5.91 nm and encapsulation efficiency (EE) was $79.29 \pm 0.77\%$. In animal experiments, *A. cinnamomea* can improve diabetes-induced reproductive dysfunction by increasing the level of follicle-stimulating hormone and luteinizing hormone. In testicular histopathology, the testes of *A. cinnamomea*-supplemented diabetic rats showed normal morphology. These results suggest that *A. cinnamomea* supplementation may be a useful strategy to treat diabetes-induced reproductive dysfunction.

60. Valencian Tiger Nut Protects Epithelial Barrier Function in Caco-2 Cells Infected by *Salmonella enteritidis*

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Cyperus esculentus is a perennial herb with rhizomes ending in hard tubers. Today, it is mainly cultivated in Southern Europe (Valencia), North and South America, and Africa. Tiger nut (*Cyperus esculentus* tubers) can be consumed raw or processed to obtain a milky beverage. It contains a wide variety of compounds, such as vitamin E, flavonoids, tannins, and dietary fiber, among others, that could help in the maintenance or improvement of the intestinal barrier function. The aim of this study was to investigate the potential beneficial role of Valencian tiger nut (*Cyperus esculentus* L. var. *sativus* Boeck tubers; VTN) in an in vitro model of intestinal inflammation established by incubation of intestinal Caco-2 cells with *Salmonella* Enteritidis. Moreover, the capacity of tiger nuts to stimulate the growth of the proven probiotic *Lactobacillus plantarum* was also tested. Differentiated Caco-2 cells were incubated for 3 h with *S. Enteritidis* at a multiplicity of infection of 10 in the absence or presence of 2.5 mg/mL VTN, and epithelial barrier function was assessed from transepithelial electrical resistance (TER) at the end of the incubation period. The results reported that the presence of VTN conferred a partial protection with respect to the infected cultures in which a significant decrease of TER was observed. In addition, VTN had the capacity to induce a significant increase in *L. plantarum* growth. In conclusion, VTN may be of great value as a functional food, since we have demonstrated its potential prebiotic capacity and its contribution to the protection of epithelial barrier function in a Caco-2 cell model disrupted by *S. enteritidis*.

61. Role of the Mediterranean Diet in the Prevention of Alzheimer Disease

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A healthy lifestyle is protective against age-related disorders. Nutrition is a critical component of lifestyle, and there is consistent scientific evidence that adhering to healthy plant-based diets is associated with reduced rates of non-communicable diseases such as cardiovascular diseases, cancer and neurodegenerative disorders. One such healthy dietary pattern, reputed for its long-ranging health benefits, is the Mediterranean diet (MeDiet). The traditional MeDiet is characterized by customary use of olive oil in the kitchen and at the table; high consumption of fruit, vegetables, legumes, cereals, and nuts; regular but moderate intake of wine with meals; moderate consumption of seafood, fermented dairy products (yogurt and cheese), poultry and eggs; and low consumption of red and processed meats, sweets and sugar-sweetened beverages. There is reasonable evidence from prospective studies suggesting that adherence to Mediterranean-style diets is associated with a reduced risk of dementia in general and of Alzheimer disease (AD), the most common form of dementia, in particular. The MeDiet has also been associated with a reduced incidence of stroke and type-2 diabetes, two strong links with AD mediated in part via vascular changes in the brain. Furthermore, brain integrity, as assessed by magnetic resonance imaging, appears to be preserved in older populations following the MeDiet. Finally, both prospective studies and randomized clinical trials have shown that adherence to the MeDiet counteracts age-related cognitive decline, a harbinger of AD. The PREDIMED study is the only long-term randomized clinical trial that has examined MeDiets (supplemented with extra-virgin olive oil or mixed nuts) versus a low-fat diet for cognitive outcomes in older individuals at high cardiovascular risk. Results have shown benefit of the MeDiet against age-related impairment of memory, executive function and global cognition. In conclusion, consistent epidemiological and clinical trial evidence point to the MeDiet as a useful tool in the prevention of AD.

62. HALO Effect of the PREDIMEDplus Study

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Background. Obesity has an important family aggregation and should be treated as a family health problem. Strategies are needed to encourage the expansion (“Halo effect”) of individual treatments on healthy lifestyles in the context of the family environment. The main objective of the study was to observe the halo effect of a healthy lifestyle intervention in patients with excess weight on the adherence to Mediterranean Diet (MedDiet) of their relatives. **Methods.** In the context of the PREDIMEDplus study, a randomized, controlled, and multicenter clinical trial in patients with excess weight, with an intensive intervention on lifestyles (hypocaloric MedDiet and PA) (intervention group (IG)) vs. control group (CG) with MedDiet recommendations, a cross-sectional study was carried out involving a subsample of 655 relatives of the PREDIMEDplus study participants (IG = 321 and CG = 334). Sociodemographic characteristics were obtained. We assessed: adherence to the MedDiet (MedDiet-PREDIMED questionnaire), weight, dietary habits, PA (Minnesota questionnaire), functional social support (Duke-UNC questionnaire), and family functional status (Family Apgar). **Results.** In the participants of the PREDIMEDplus study ($n = 579$), a higher score of adherence to MedDiet was observed in the IG, compared to the CG (10.2 vs. 9.1 points). Relatives of the participants: Mean age 59.8 years and 40.4% women. *Halo effect:* Relatives of the IG, with respect to CG, had a higher score of adherence to MedDiet (8.8 vs. 8.3 points, $p = 0.001$), and a high percentage of relatives had a good adherence to the MedDiet (87.9 vs. 82.3%, $p = 0.05$). In addition, relatives with good adherence to MedDiet, compared to those with poor adherence, were older, had less weight, higher total PA, better functional social support and family functional status, and ate with the participants more frequently ($p < 0.05$). **Conclusions.** This study observed favorable changes in lifestyles in the relatives of participants in an intervention study of healthy lifestyles.

63. Mediation Analysis to Understand the Role of Overweight on the Relationship between Mediterranean Diet and Risk of Type 2 Diabetes Mellitus: Evidence from 21,612 UK Biobank Participants

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Introduction: The Mediterranean diet is widely recognized for its beneficial effects on the prevention of type 2 diabetes mellitus (T2DM). However, the specific contribution of the Mediterranean diet and its combined effect on overweight, on the risk of T2DM remains unclear. **Methods:** Based on 21,612 participants from the UK Biobank cohort with baseline nutritional data (up to five 24 h dietary recalls) and incident diabetic status over time, we performed mediation analysis to determine to which extent the association between a Mediterranean diet and the risk of T2DM was mediated by overweight. **Results:** During a mean follow-up of 6.1 years, 475 participants developed incident T2DM. The mean Mediterranean diet score was 8.1 out of 18 for T2DM cases and 8.8 for controls. Mediation results suggested that higher adherence to a Mediterranean-type diet decreased the risk of T2DM by 14% as a whole (HR 0.86, 95%CI [0.83–0.90]). This whole association was decomposed into an estimated indirect effect of 10%, mediated by lower odds of developing overweight (HR 0.90, 95%CI [0.88–0.92]), and an estimated direct effect of the diet of 4% (HR 0.96 95%CI [0.93–0.99]), regardless of the effect mediated by overweight. **Discussion:** These findings suggest that overweight, considered as a single mediator, contributes substantially, but not totally, to the whole association between Mediterranean diet and lower risk of T2DM. Whatever the overweight status, a specific effect of diet on the risk of T2DM was also observed, although weaker, suggesting a double benefit of the Mediterranean diet on overweight and T2DM prevention.

64. The Impact of Incorporation of Lentil Semolina on Nutritional, Technological, and Microbiological Parameters of Fortified Moroccan Couscous

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Nutrient deficiencies are a major public health problem in Morocco, affecting nearly a third of the population and concerning mainly proteins and iron. Couscous is a traditional dish specific to the African countries of the Mediterranean. In Morocco, it is consumed regularly on Fridays and days of family reunion. The possibility of getting couscous from other products such as lentils remains an interesting alternative to improve product quality. Lentils are rich in protein (20%–36%) and an excellent source of a large range of micronutrients. In order to contribute to the reduction of the incidence of malnutrition in Morocco, the current investigation aimed to elaborate a fortified couscous with lentil semolina (FCLS) and study the effects of this substitution on its nutritional, technological, and microbiological characteristics. Conventional Moroccan couscous (CMC), FCLS at different levels of 25%, 50%, and 75%, and couscous made of lentil semolina only (CLS) were analyzed in duplicate for their moisture, ash, and nutritional quality (proteins, fat, carbohydrates, iron, sodium and potassium), for their technological attributes (color (a, b, L, and IB) and swelling index), and for some of their microbiological parameters (molds and yeasts). Nutritionally, the highest contents of proteins, iron, and potassium were found in FCLS at 75%, while fat, carbohydrates, and sodium amounts were the lowest at this level. From a technological point of view, FCLS at 25% showed the closest results to the technological parameters of CMC. Microbiological tests revealed that FCLS is healthier than CMC in terms of yeast and mold content. From the obtained results, it seems to be possible to partially substitute CMC with lentil semolina, at least at 25% to enhance its nutritional value without a negative influence on its technological and microbiological parameters.

65. The Relationship between Nutrient Intake and Adherence to Mediterranean Diet in Nutrition and Dietetic Students

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Introduction: Mediterranean diet (MD) is considered as one of the healthiest dietary patterns in the world. The aim of this study was to determine differences in nutrient intake by adherence to MD in Nutrition and Dietetics students at the Near East University in Cyprus. **Material and Methods:** The study was conducted on 126 Nutrition and Dietetics students, aged 18 to 32 years. Nutrient intakes of students were determined using 72 h food recall record. The MD score (MDS) was calculated, and then classified into three groups: high (36–55 points), moderate (21–35 points), and poor (0–20 points). The study protocol was approved by the Ethics Committee at Near East University. All statistical analysis was performed using SPSS v.18.0. **Results:** The percentage of total energy from each macronutrient was approximately $17.5 \pm 5.6\%$ proteins, $46.9 \pm 8.1\%$ carbohydrates, and $35.3 \pm 6.8\%$ lipids. The ratio of polyunsaturated to monounsaturated fatty acids only reached 0.8 ± 0.3 . Consumption of whole grains, potato, fruits, legumes, poultry, whole dairy products, meat, and olive oil are found to be significantly in relation with MDS ($p \leq 0.001$). No significant association was found between MDS and vegetables, fish, and alcohol consumption. Protein, calcium, and magnesium intake of students who had low MD adherence was significantly higher than that in the moderate adherence group ($p < 0.05$). On the other hand, students with moderate adherence to MD had significantly higher carotene intake than the poor adherence group ($p < 0.05$). According to study results, there was no student who had high adherence to MD. Otherwise, 31.0% of students were found to have low adherence, and 69.0% of students had moderate adherence to MD. **Conclusion:** The university students need to consolidate healthy dietary habits based on an adequate selection of food, which is a factor of fundamental importance in maintaining good health and preventing disease. The findings indicate that the Nutrition and Dietetic students' eating habits need improvement.

66. (BENEFICIAL) Beans/Bran Enriching Nutritional Eating for Intestinal Health and Cancer, Including Activity for Longevity

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The global recommendations for colorectal cancer (CRC) prevention includes regular physical activity (PA) (150 min/week) and a diet rich in fiber (30g/day). Navy beans (NB) and rice bran (RB) inhibit colon cancer formation in animals, and these foods were shown to modulate metabolism by gut microbiomes in humans. BENEFICIAL is a human clinical study examining fiber intake with NB and RB, compared to a fiber supplement, while accounting for PA levels to reduce CRC risk. **Methods:** This pilot study enrolled 20 participants with Stage 0–I colon cancer. Participants were allocated to placebo (fibersol-2: 10 g/per day) or intervention (rice bran 30 g/day + navy bean 30 g/day) for 3 months. Fiber intake was measured through study foods and normal diet consumption. Nutritionist Pro was used to analyze 3-day food records, and ASA 24 was used for healthy eating index (HEI) measures. Blood, urine, and stool were evaluated using targeted and nontargeted metabolomics to measure biomarkers of dietary intake and provide evidence for the impacts of fiber on blood lipids and gut microbiome metabolism. PA was measured using activePal accelerometers worn for 7 consecutive days. All participants received a PA education session aligned with the American Cancer Society (CSU IRB #17-7464H). Repeated-measures 2-way ANOVA was applied for analysis over time and between groups. **Results:** There was increased daily fiber intake through the consumption of study powders for all participants and improved HEI scores. All participants exceeded PA guidelines for moderate to vigorous activity (min/week), yet average steps per day were not met (steps/day). Participants' consuming RB/NB showed changes in short chain fatty acids, primary and secondary bile acids, as well as phytochemicals such as salicylate. We observed decreased serum triglycerides and elevated HDL in the intervention group after 3 months when compared to the control group. **Conclusion:** This study demonstrates a practical and affordable means of adhering to guidelines for CRC control and prevention in a high-risk population.

67. Alcoholic Beverage Consumption Is Associated with *Trans* Fat and Total Sugar Intake in Brazilian Faculty

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Alcohol consumption has been associated with low quality diets. This study aimed to investigate the association between alcoholic beverages consumption and dietary intake in Brazilian faculty. A cross-sectional study was carried out in 2017–2018 in a public university in Rio de Janeiro, Brazil. Data were collected using a self-administered questionnaire, including a reduced FFQ with 46 food items and a question on alcoholic beverage consumption (yes/no). Those who answered “yes” to the later question informed the frequency of alcohol consumption. Energy and selected nutrient intake were categorized into tertiles. Frequency of alcohol consumption was categorized into: never/rarely (abstemious/once a month), regular (1–3 times/month to twice a week), and frequent (≥ 3 days/week). The association between alcohol intake and dietary variables was assessed using the chi-square test ($p < 0.10$). Among the 113 faculty investigated (mean age = 48.5 years old; 64% women), alcoholic beverages were never or rarely consumed by 31% ($n = 35$), regularly by 51% ($n = 58$), and frequently by 18% ($n = 20$). In general, no difference was observed in dietary intake according to frequency of alcohol consumption. However, there was a greater concentration of individuals who never/rarely consumed alcoholic beverages in tertile 1 of trans fat (46%) compared to those reporting regular (29%) or frequent (20%) alcohol consumption ($p = 0.04$). A greater proportion of individuals was observed that never/rarely consumed alcoholic beverages in tertile 3 of total sugar intake (43%) compared to their counterparts with regular (36%) or frequent (10%) alcohol consumption ($p = 0.09$). Reduced consumption of alcoholic beverages was associated with lower *trans* fat and higher total sugar intake, which may be related to the lower consumption of fatty foods, which usually accompany alcoholic beverage drinking, and to a greater consumption of sugar-added beverages, which may replace alcoholic beverages in social occasions. The findings may be important to inform nutrition education activities.

68. Are Older Adults without a Healthy Diet Less Physically Active and More Sedentary?

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Few studies on older populations consider several energy balance-related behaviors together. This cross-sectional study compared subjectively and objectively measured physical activity (PA) and sedentary behavior (SB) patterns between older adults with and without a healthy diet. We recruited 127 community-dwelling older Taiwanese adults (69.9 ± 5.0 years); data were collected during April and September 2018. Objectively measured total PA, moderate-to-vigorous PA, light PA, step count, total sedentary time, duration of sedentary bouts, number of sedentary bouts, and number of sedentary breaks were assessed using activity monitors. Subjectively measured PA and SB were measured using the International Physical Activity Questionnaire and Sedentary Behavior Questionnaire for Older Adults. Chi-square tests and independent sample *t*-tests were performed. For subjective measures, older adults without a healthy diet spent significantly less total leisure time on PA and more leisure sitting time than those with a healthy diet. For objective measures, older adults without a healthy diet spent less time on light PA and had a higher total sedentary time, duration of sedentary bouts, times of sedentary bouts, and times of sedentary breaks than those with a healthy diet. Regardless of the use of objective or subjective measurements, older adults without a healthy diet engaged in a more inactive and sedentary lifestyle. These findings have implications for health promotion practitioners in designing tailored interventions.

69. Association between Autistic Traits and Nutrient Intake *

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** Selected Poster for the Best Poster Award*

Dietary problems, which can lead to deficiencies of essential nutrients, are common among children with autism spectrum disorders. However, dietary habits among adults with autistic traits have not been well established. We investigated the association between nutrient intake and autistic traits using data from the Eating Habit and Well-Being (Eat-Well) study in Japanese workers. Autism traits were assessed using the Japanese version of the Subthreshold Autism Trait Questionnaire (SATQ), in which higher scores indicate more severe autistic traits. Dietary intake was evaluated using the validated 87-food item food frequency questionnaire (FFQ) developed for Japanese adults. Energy-adjusted nutrient intake was assessed using a nutrient residual model. Associations between the SATQ score and nutrient intake were examined by multiple linear regression analysis using each nutrient intake as a dependent variable, and the SATQ score as an independent variable. A total of 2382 participants were included in the Eat-Well study; 1440 men and 613 women without missing data were analyzed. The SATQ score was not associated with total energy intake in both sexes. The SATQ score was marginally and inversely associated with iron, vitamin K, and vitamin B₁₂ intake in men and was inversely associated with protein ($\beta = -0.158, p < 0.001$), fat ($\beta = -0.093, p = 0.020$), vitamins, minerals, and dietary fiber ($\beta = -0.125, p = 0.001$) intake in women. Furthermore, the SATQ score was positively associated with carbohydrate intake in women only ($\beta = 0.156, p < 0.001$). This study revealed associations between autistic traits and diet even among nonclinical adults in the general working population.

70. Breastfeeding May Improve Vegetable but Not Fruit Consumption in Later Childhood

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Previous studies have shown that breastfeeding may influence the consumption of fruit and vegetables in later childhood. The aim of this study was to assess the association between breastfeeding and subsequent consumption of fruit and vegetables in later childhood. The study was conducted within the Project “ABC of Healthy Eating” among a representative sample of 800 pairs of mothers and children aged 7–12 years from Poland who were recruited using a systematic selection process. Purposive-quota selection according to gender, age, place of residence, and region was applied. The study was conducted by well-trained interviewers in the respondents’ homes in 2017. Logistic regression analysis was conducted, and models adjusted for children’s age and gender, and maternal education were created. Almost 86% of children were breastfed at some point. A higher percentage of breastfed than nonbreastfed children consumed vegetables for breakfast (34% vs. 17%, $p \leq 0.01$), second breakfast (25% vs. 19%, $p \leq 0.01$), and dinner (62% vs. 47%, $p \leq 0.05$). Fruit for breakfast, second breakfast, and dinner was consumed by 18%, 37%, and 6% of children, irrespective of breastfeeding ($p > 0.05$). Breastfeeding for a period of 4–6 months increased the chance of vegetable consumption for breakfast in the whole group (aOR 3.58, 95%CI 1.74–7.35, $p \leq 0.001$), and particularly in girls (aOR 5.50, 95%CI 1.66–18.21, $p \leq 0.01$) when compared to boys (aOR 2.62, 95%CI 1.04–6.61, $p \leq 0.05$). Longer duration of breastfeeding (over 12 months) increased the chance of vegetable consumption for dinner in the total group (aOR 2.48, 95%CI 1.26–4.88, $p \leq 0.01$) and in boys (aOR 2.57, 95%CI 1.05–6.30, $p \leq 0.05$). There was no association between breastfeeding and subsequent fruit consumption in later childhood. Breastfeeding during the first six months of life was associated with higher frequency of vegetable consumption in children aged 7–12 years. Promotion of breastfeeding according to WHO recommendations may additionally improve the nutritional behavior, particularly vegetable intake in childhood and adolescence.

71. Epigenome-Wide Association Study in Childhood Obesity: Searching Novel Markers for Late Disease Risk *

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Obesity is a devastating disease that shortens life expectancy by increasing the risk of cardiovascular disease, metabolic disorders, and diverse types of cancer. Childhood obesity is reaching epidemic proportions. The main challenges in childhood obesity are that (1) more than 80% of overweight or obese children will maintain this condition as adults, and (2) therefore, the comorbidities described above emerge very early and become even more pronounced throughout life. The epigenome (DNA methylation, histone variation, noncoding RNAs) registers environmental factors (intrauterine environment, nutrition, etc.) mainly during early life, and it translates them into very stable gene expression patterns throughout one's lifespan. It is proposed that a certain number of these epigenetic marks result in permanent adaptations that could program the individual to develop obesity and metabolic diseases later on. Therefore, it is critical to identify early causal markers of the disease to devise prevention strategies and future potential interventions. Here, we examined the DNA methylation profiles (Infinium Methylation EPIC BeadChips 850 K) in whole blood from lean and obese prepubertal children. The methylation of 109 CpG sites was altered in children with obesity. Two of these are potentially causative for obesity and type 2 diabetes (Two Sample Mendelian Randomization Test). Interestingly, both are mapped in the SPATC1L (Spermatogenesis and Centriole Associated 1 Like) genetic *locus*, and they are very close to collagen-coding genes linked to obesity. In fact, the expression of *COL6A1* and *COL6A2* (Collagen Type VI Alpha 1 and 2 Chains) was altered in children with obesity. We hypothesize that both CpG sites might mediate disease risk by modulating the expression of genes in close vicinity. Hence, at this moment, we are carrying out experiments to confirm that the methylation status of the SPATC1L *locus* is causative of childhood obesity through the edition of the epigenome by a system of CRISPR-dCas9 in adipocytes.

72. Influence of Potato Cooking Method on Subjective Ratings of Satiety, Hunger, and Appetite Compared to a Control Meal of Rice

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Introduction: Dietary recommendations for management of type 2 diabetes (T2DM) advise avoidance of high glycemic (GI) foods, such as potatoes. Different cooking methods of potatoes alter GI, with the GI influencing its satiating properties: High GI foods decrease satiety. The effect of GI and cooking method of potato on satiety remains unclear. We investigated satiating properties of three potato cooking methods compared to basmati rice in individuals with T2DM. **Methods:** Using a randomized cross-over design, 19 males and females (age: 56.8 ± 9.8 y; BMI: 31.7 ± 6.5 kg/m²) with T2DM (diet or metformin controlled) consumed four isoenergetic mixed-evening meals incorporating either: (1) boiled potato (Boiled), (2) roasted potato (Roasted), (3) boiled and then cooled for 24 h potato (Cooled) or (4) control condition of low GI basmati rice (Rice). Dietary intake was standardized the day of and prior to each condition according to estimated individual daily energy requirements. Subjective satiety, fullness, and prospective food consumption (appetite) were measured using an electronic 100 mm Visual Analogue Scale (VAS; where 0 = low (i.e., not full) and 100 = high (i.e., very full), completed prior to and two hours following trial day dinner. **Results:** Satiety ratings were lowest post-rice condition (Rice: 64 ± 23) but not statistically different (Boiled: 80 ± 16 , Roasted: 80 ± 17 , Cooled: 71 ± 23 , $p = 0.82$). There were no differences in appetite before (Boiled: 50 ± 20 , Roasted: 44 ± 21 , Cooled: 46 ± 30 , Rice: 49 ± 21 ; $p = 0.98$) or after evening meals (Boiled: 11 ± 15 , Roasted: 14 ± 14 , Cooled: 14 ± 18 , Rice: 16 ± 15 ; $p = 0.89$). Similarly, there were no differences in fullness between conditions (Boiled: 85 ± 13 , Roasted: 85 ± 15 , Cooled: 80 ± 23 , Rice: 78 ± 15 ; $p = 0.99$). **Conclusion:** The potato cooking method did not influence subjective ratings of satiety, fullness or appetite. The ratings of these measures did not differ between foods classified as high GI (potato) and low GI (rice), suggesting that GI values of foods may not be a valid predictor for appetite suppression and subjective satiety.

73. Maternal Fructose Produces a Defect in XBP1s Nuclear Translocation Affecting the ER-Stress Resolution

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Endoplasmic reticulum (ER) homeostasis is crucial to appropriate cell functioning. When disturbed, a safeguard system called unfolded protein response (UPR) is activated. ER-stress has been related to metabolic syndrome. Fructose consumption seems to modify ER homeostasis. Moreover, ER-stress has been linked to early pregnancy loss. Therefore, we investigated whether maternal fructose intake in rats affects ER status and induces UPR. Liquid fructose (10% w/v) was found to partially activate ER-stress in maternal and fetal liver and placenta. In fact, a fructose-induction of the levels of pIRE1 (phosphorylated inositol requiring enzyme-1) and its downstream effector, X-box binding protein-1 spliced form (XBP1s), was observed in all tissues. XBP1s is a key transcription factor; however, XBP1s nuclear translocation and the mRNA expression of its target genes were reduced in liver of carbohydrate-fed mothers and specifically diminished in fetal liver and placenta from fructose-fed mothers. These XBP1s target genes belong to the ER-associated protein degradation (ERAD) system, used to buffer ER-stress and to restore ER-homeostasis. It is well known that XBP1s needs to form a complex with proteins such as PI3K, to migrate to the nucleus. Since methylglyoxal (MGO) content, a precursor of advanced glycation endproducts (AGE), was augmented in the three tissues from fructose-fed mothers and has been related to interference with the function of many proteins, including PI3K, the role of MGO in XBP1s migration should not be discarded. In conclusion, maternal fructose intake produces ER-stress, but without XBP1s nuclear migration. Therefore, a complete activation of UPR which would resolve ER-stress is lacking. Moreover, a state of fructose-induced oxidative stress is probably involved.

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74. Reasons for Consumption and Adverse Health Outcomes of Energy Drinks Mixed with Alcohol in Costa Rican Students Aged 7 to 18

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Worldwide energy drinks mixed with alcohol have been increasingly consumed by teenagers to celebrate a special occasion and to maintain alertness. We wanted to identify the reasons for consumption of energy drinks mixed with alcohol and negative behaviors associated with this practice in a national sample of Costa Rican students of 7 to 18 years old. A mixed cross-sectional study with students ($n = 2667$) recruited according to ethical standards in 64 educative centers was conducted. A validated questionnaire was used to assess the following behaviors: lifetime addictive behaviors (cocaine and marijuana), physical violence, low educational expectative, self-harm conduct, suicidal ideation, and cyberbullying, among other variables. Multivariate models were performed with the SPSS program and were adjusted for age, socioeconomic level, and gender. A value of $p < 0.05$ was considered significant. Focus groups were performed according to each study category, and Atlas.Ti was used to analyze the information. Near 3% of the students drank energy beverages mixed with alcohol (64 boys and 11 girls). Alcohol and energy drink consumers presented a higher prevalence of the following behaviors compared to nonconsumers: use of cocaine and marijuana (OR 5.6 (3.2–9.9)); bullying (OR 4.5 (2.8–7.2)); suicidal ideation (OR 3.4 (2.0–5.6)); self-harm conduct (OR 3.2 (1.8–5.9)); low educational expectative (OR 2.6 (1.4–4.6)); and cyberbullying (OR 2.0 (1.2–3.2)). Among the reasons found for energy-alcohol drink consumption were: to stay awake to do homework, to win a sports championship, and to drink more without getting drunk at parties. Educational strategies should aim to improve public awareness of the negative results associated with energy-alcohol drink consumption, especially among children and adolescents.

75. Sleep Duration May Influence Changes in Children and Adolescents' Food Consumption after a Nutrition Education Intervention *

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Sleep deprivation has been associated with the imbalance of hormones ghrelin and leptin, increasing food consumption, mainly of unhealthy foods. This study aimed to estimate the effect of sleep duration on changes in the consumption of healthy and unhealthy diet markers after a nutrition education intervention with children and adolescents. A community-randomized school-based trial was conducted in 2016 with 5th and 6th graders in a low-income area, Rio de Janeiro, Brazil. This analysis includes only students from the intervention arm. Data were collected with a self-administered electronic questionnaire, including questions on the weekly frequency of consumption of selected foods (beans, milk, fruits, fresh-squeezed fruit juices, vegetables, packaged filling biscuits, coldcuts, and soda). Sleep duration was estimated using habitual bedtime and wake time. Mixed models for continuous variables with asymmetric distribution were applied to estimate the association between sleep duration and changes in food consumption using the PROC Genmod procedure, gamma model with logarithmic function, Statistical Analysis System-SAS, version 9.3. The models were adjusted by sex and age. Statistical significance was considered at the level of 5%. The analysis included 1061 children and adolescents (9 to 17 years old); 50.1% male, mean daily sleep duration was 9.04 hours (SD = 2.10). In general, the mean frequency of soda consumption was 4.8 times/week in the baseline and 4.7 times/week after the intervention. Remarkably, a reduction of 5% in the weekly frequency of soda consumption was observed for each one-hour increase in sleep duration, even after adjusting for sex and age (Exp β = 0.95, 95%CI: 0.91; 0.99). Sleep duration modified the effect of educational intervention on changes in food consumption and may be associated to increased consumption of unhealthy foods among children and adolescents. Variables related to sleep duration and quality should be considered in the evaluation of interventions designed to modify eating behavior.

76. The Effect of Supplementation and Resistance Training on Visual–Spatial Memory and Blood Markers in Elderly Women

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L-carnitine can be metabolized to trimethylamine N-oxide (TMAO), a molecule which is considered to promote atherogenesis by interaction with macrophages and lipid metabolism [1]. Aging-associated increase in plasma TMAO may reduce expression of synaptic plasticity-related proteins in an animal model study [2]. Moreover, treatment by TMAO may deteriorate brain aging and age-related cognitive dysfunction [2].

The purpose of the present study was to assess whether the 24-week resistance training in combination with L-carnitine supplementation affects plasma TMAO concentration and thus promotes changes in cognitive functions and serum brain-derived neurotrophic factor (BDNF) level.

Over the 24-weeks period, women +60 years old participated in the resistance training program twice a week according to the protocol described previously [3]. The control group participated in the training protocol without any supplementation, whereas two other groups were supplemented with either 4000 mg L-leucine per day or 1000 mg L-carnitine-L-tartrate in combination with 3000 mg L-leucine per day throughout the study period.

Before the start and after the end of the study, cognitive functions were tested via the CORSI test in the Vienna Test System, and fasting blood samples were taken to determine TMAO and BDNF level. TMAO plasma concentration was measured via the UPLC/MS/MS method and serum BDNF level was determined via the enzyme immunoassay method.

In a present study, L-carnitine supplementation elevated fasting plasma TMAO concentration but did not affect BDNF serum level. The main effect of resistance training on visual–spatial memory in the CORSI test was observed with no differences between groups.

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77. Benefits of Following a Mediterranean Diet on the Cardiovascular Risk Factors Associated with Dementia in Balearic People

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Introduction: Aging is a major risk factor for chronic disease. Among age-related diseases is dementia with cognitive decline. Good nutrition is important for optimal maintenance of cognition and modifiable risk factors for dementia such as diabetes, hypertension, and obesity. The aim of this study was to evaluate the benefits of high adherence to a Mediterranean diet (Med-Diet) and the association with reduced risk in the progression of dementia.

Material and methods: This study was observational in 82 elderly people aged 65–95, who followed Med-Diet in a Balearic attention center of memory disorder for 12 months. Compliance was measured by eating (breakfast and lunch) in the same center and with the same menu, with cooking methods also considered. The cardiovascular risk factors and anthropometric measures were analyzed. Additionally, the physical–cognitive state was evaluated by the Barthel index, as well as the mini-mental state, Tinetti test, and minimum basic data of cognition level. **Results:** After 12 months following higher adherence to a Med-Diet, we observed a significant decrease in high hypertension, systolic and diastolic pressure ($p = 0.006$; $p = 0.001$, respectively) and glycemia ($p = 0.05$). On the other hand, the anthropometric measurements did not change. nevertheless, no significant differences were shown in the evaluation of the physical–cognitive state. **Conclusion:** High adherence to Med-Diet could offer the potential to reduce the risk of progression of dementia and improve the cardiovascular risks that are associated with the risk of dementia.

78. Frequency of Consumption of Dairy Products and the 10-Year Risk of Frailty among the Older Community-Dwellers from the Three-City-Bordeaux Cohort *

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Successful aging is a priority to avoid age-related disability and before that, frailty. Frailty is a geriatric syndrome that can be delayed by modifiable factors, such as nutrition. Low intakes of macro- and micronutrients from dairy products (DP) have been associated with a higher risk of frailty, while DP intakes have themselves been scarcely studied. The objective was to assess the association between frequency of DP intakes and the 10-year risk of frailty among older adults from the general population. The study sample consisted of participants from the Three-City-Bordeaux cohort, aged ≥ 65 y in 1999–2000, with available nutritional data, and re-examined 10 y later. Frailty was defined by the presence of at least three of the following criteria: unintentional weight loss, fatigue, muscle weakness, slowness, and inactivity (Fried et al.). The consumption of DP was recorded from a food usual frequency questionnaire. A low frequency was defined as Q1 of the whole DP frequency, a moderate frequency as Q2–Q3, while the highest daily DP frequency as Q4. Multivariate logistic regressions were controlled for age, education, sex, comorbidities, disability, total protein intake, and healthy diet. The studied sample constituted of 907 nonfrail participants aged 73.1 y on average at baseline, and 65.2% were women. Over the 10-year follow-up, 23.3% were identified as frail. The frequency of daily DP consumption ranged from 0–8-fold/day. Q1 was 1.7-fold/day, while Q4 was ≥ 3 -fold/day. According to multivariate analyses, there was no association between the frequency of daily DP consumption and the 10-y risk of frailty (Q2–Q3 vs. Q1: OR 0.76, IC[0.49;1.17]/Q4 vs. Q1: OR 0.85 IC[0.52;1.39], p global = 0.46). In this sample of French older adults, a higher frequency of DP consumption was not significantly associated with the risk of frailty 10 y later. The next step will be to consider DP subtypes as isolated exposure.

79. Malnutrition, Loneliness, and Risk of Death among Community-Dwellers from the Three-City-Bordeaux Cohort

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Introduction. As part of geriatric syndromes, malnutrition and risk for malnutrition have been associated with a higher risk of death. On the other hand, loneliness has also been associated with adverse outcomes, in part due to a delayed recourse to care. An overlap between malnutrition and loneliness may exist. The hypothesis was that malnutrition and loneliness could act in synergy to overexpand to the risk of death. **Objective.** The aim was to test this hypothesis among a subsample of older adults enrolled in the Three-City-Bordeaux cohort and followed for up to 5 years. **Methods.** The studied sample was composed of 898 participants aged 82.5 y on average in 2010, and followed for 4 y. The risk for malnutrition was assessed using the short-form of the Mini Nutritional Assessment (MNA). Living alone and the feeling of loneliness have both been considered as markers of social isolation. Cox models adjusted for age, gender, educational level, comorbidities, and polypharmacy have been used to assess the associations between (i) malnutrition, (ii) social isolation, and (iii) malnutrition and social isolation on the risk of death. **Results.** The risk of undernutrition was observed among 199 participants, while 498 participants were considered as isolated. Over the follow-up, 163 participants died. The risk of undernutrition was significantly associated with a higher risk of death (HR = 1.53, IC95% 1.09–2.15). Social isolation was not significantly associated with the risk of death (HR = 1.06, IC95% 0.75–1.50). Participants who exhibited both risk for undernutrition and social isolation were not overexposed to the risk of death (HR = 1.57, IC95% 1.07–2.33) than those suffering only from undernutrition. **Conclusion.** The risk of undernutrition, whatever the social isolation, was associated with a higher risk of death among this French subsample of older adults, suggesting that nutritional status should be considered as a relevant health criterion also among not disabled elderly community-dwellers who live alone at home.

80. Patients with Advanced Parkinson's Disease Eat Less Food in Comparison to Early Parkinson's Patients and Healthy Controls in a Controlled Clinical Lunch Setting; A Preliminary Analysis

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Background: Unintentional weight loss and malnutrition have been observed among Parkinson's disease (PD) patients. Changes in food intake (FI) and eating behavior, potentially caused by fine motor dysfunction and eating-related symptomatology (e.g., dysphagia, olfactory impairment) could potentially explain these observations, but no objective study has been conducted to evaluate this relationship. **Methods:** The aim of this ongoing study was to explain FI among a sample of early ($n = 21$; age 61.4 ± 8.7 years; Hoehn and Yahr stage (H&Y) ≤ 2 , disease duration ≤ 5 years) and advanced PD patients ($n = 14$; age 63.1 ± 7.1 ; H&Y > 2 , disease duration ≥ 7 years) and healthy controls ($n = 13$; age 60.9 ± 8.3). Participants freely ate standardized meals (served portions: 400 g sausages, 200 g potato salad, and 200 g apple purée), monitored through cameras at the hospital, while the consumed food was measured with a weighing scale. Multiple regression models were performed to explain FI. **Results:** Advanced PD patients ate significantly less food (202 kcal, $P < 0.05$) than healthy controls and early PD patients when controlling for gender. Adding number of mouthfuls (74 kcal group difference, $P = 0.379$), meal duration (112 kcal, $P = 0.277$), and chews/g of food (163 kcal, $P = 0.114$) to the model reduced this association, while eating rate did not. However, when PD patients (early and advanced combined) were compared to healthy controls, there was no significant difference in FI. **Conclusion:** Weight loss and malnutrition among PD patients might be explained by lower FI, mediated by fewer mouthfuls and shorter meal durations. Our results indicate that interventions to elongate meals and prompt advanced PD patients to take more mouthfuls have the potential to be clinically useful in protecting against unintentional weight loss and malnutrition. Additional data collection might facilitate the creation of early, eating-based, behavioral tests for the evaluation of the disease's trajectory.

81. Single-Dose Comparative Bioavailability Study of Three Coenzyme Q10 Formulations in Healthy Older Adults

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Introduction: Coenzyme Q10 (CoQ10) plays a central role in mitochondrial oxidative phosphorylation. Several studies showed beneficial effects of dietary CoQ10 supplementation, particularly in relation to cardiovascular health. CoQ10 biosynthesis is depleted in elderly populations; consequently, the beneficial effects in this population are of greater significance. However, current pharmacokinetic studies were mostly conducted on the younger population. **Goal:** To compare the pharmacokinetic profile of different CoQ10 formulations with a clinical study in healthy older adults. **Method:** A randomized, three-period crossover bioavailability study was conducted on 21 healthy older adults (aged 65–74). Treatment was done as a single dose with a one-week wash-out period, using three different formulations containing the equivalent of 100 mg CoQ10: capsules containing ubiquinone (standard product; SP), soft-gel capsules containing ubiquinol (comparator product; CP), and a syrup containing water-soluble ubiquinone in the form of Valens Q10Vital® (investigational product: IP). Plasma ubiquinone/ubiquinol was followed for 48 hours. **Results:** The mean \pm SD values of maximum total CoQ10 plasma concentration above the baseline content (Δ cmax) were 0.97 ± 0.55 , 0.90 ± 0.90 , and 0.52 ± 0.38 mg/L for the IP, CP, and SP, respectively. Based on the ratio of area under the baseline corrected concentration curve (AUC 48 h), the bioavailability of CoQ10 of the IP is 2.4-fold higher (95%CI: 1.4–4.2; $p = 0.002$) compared to that of the SP, and 1.5-fold higher (95%CI: 0.91–2.2; $p = 0.11$ and $p = 0.016$ for non-inferiority) compared to that of the CP. The ratios of the reduced vs. total CoQ10 for AUC48 were 90%, 89%, and 84% for the IP, CP, and SP, respectively. **Conclusion:** Better relative bioavailability of CoQ10 in the form of Valens Q10Vital® over standard products was determined in older adults. No differences in the redox status of the absorbed coenzyme Q10 were observed between formulations, showing that the CoQ10 appears in blood mostly as ubiquinol, also if consumed as ubiquinone.

82. The Impact of Fermented Milk and Exercise Intervention on Indicators of Frailty and Malnutrition in the Elderly in Lesotho

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Introduction: Many studies have reported on the impact of interventions on frailty in the elderly from developed countries, but evidence from developed countries is lacking. **Methods:** A pre-test–post-test study design was applied in the Maseru District of Lesotho. At baseline, the level of frailty and malnutrition were determined in 300 elderly participants. A total of 120 who were classified as prefrail, frail, and/or malnourished participated in the intervention phase of the study. Information about sociodemography, nutritional status (mini nutritional assessment), and frailty (Rockwood scale) were collected before and after three months of intervention. In three groups of 40 each, Group 1 received the fermented milk and exercise intervention; Group 2 only the fermented milk; and Group 3 comprised the control group over 12 weeks. The physical activity intervention consisted of sessions lasting for 1 hour a day on three days a week, while fermented milk was delivered every second day. **Results:** Two thirds were female, with a median age of between 74.4–76.1 years (range 64.3–94 years). More than 60% were widowed and had a low literacy level (primary school). More than 80% lived in brick or concrete houses and used pit latrines. At baseline, only 4.9% of participants in the milk and exercise group, 17.8% of those in the milk group, and 12.8% in the control group were classified as well-nourished, while 12.5% in the milk and exercise group, 28.9% in the milk group, and 28.9% in the control group were categorized as pre-frail and frail. After twelve weeks of intervention, no significant improvements in any indicators of frailty or malnutrition were observed in any of the groups. **Conclusion:** The amount of fermented milk was probably not enough to impact on measures of frailty and malnutrition. The food security situation of the elderly in Lesotho resulted in sharing of the milk. Research related to the unique nutrition situation and relevant nutrition interventions is urgently required.

83. Effect of Hesperidin on Intestinal IgA in High-Intensity Trained Rats *

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High-intensity exercise alters immune and gastrointestinal functions [1]. The flavanone hesperidin has shown an immunomodulatory role in the gut-associated lymphoid tissue in rats [2]. Previous studies assessed the positive effects of hesperidin on exercise-induced oxidative stress [3], but it remains uncertain whether it also improves exercise-induced mucosal immunity dysfunction. The aim of this study was to establish the effect of oral hesperidin supplementation on the intestinal immune system in a model of high-intensity exercise in rats by assessing changes in small intestine and caecal IgA contents and bacteria coated to IgA. For this purpose, 4-week-old female Wistar rats were randomized into an exercised training group or a sedentary group. High-intensity training was induced in rats by running in a treadmill 5 days per week (including 2 exhausting tests) for 5 weeks. Throughout the training period, 200 mg hesperidin per kg of body weight was administered by oral gavage three times per week. At the end, samples were obtained after performing a regular training (*trained* group), immediately after carrying out a final exhaustion test (*exhausted* group) and during the recovery period following the final exhaustion test (*24 h-post-exhaustion* group). The results showed that hesperidin administration improved exercise performance during training. The final exhaustion test decreased small intestine IgA concentration after 24 h. Nevertheless, hesperidin administration prevented this negative effect, maintaining similar intestinal IgA levels as those in sedentary rats. Hesperidin also increased the caecal IgA content in *trained* rats and tended to increase IgA-coated bacteria proportion in all the exercised groups. Overall, hesperidin supplementation contributes to maintaining gut homeostasis by increasing intestinal IgA content in high-intensity trained rats.

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84. Intake of Anti-Inflammatory Micronutrient in Brazilian Adolescents: Study of Cardiovascular Risk in Adolescents—ERICA

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Low-grade inflammation is associated with obesity and chronic noncommunicable diseases. This study aimed to describe the consumption of anti-inflammatory nutrients in Brazilian adolescents. Data are from ERICA (2013–14), a cross-sectional study with a nationwide representative sample of adolescents (12 to 17 years old; $n = 71,740$). Food consumption was estimated by means of a computerized 24-hour recall. Statistical analyzes were performed in R (package survey) considering the complex sample design and weights. Means and 95% confidence intervals (95%CI) of selected micronutrients intake were calculated for raw and energy-adjusted (residual method) estimates according to sex. The mean daily raw intake of vitamin A ranged from 541 μg (boys) to 576 μg (girls); vitamin E, from 4.0 mg (girls) to 4.8 mg (boys); vitamin C, from 204 mg (boys) to 205 mg (girls); selenium, from 90 μg (girls) to 107 μg (boys); manganese, from 3.0 mg (girls) to 3.6 mg (boys); zinc, from 11.5 mg (girls) to 14.3 mg (boys); and copper, from 1.4 mg (girls) to 1.5 mg (boys). Compared to girls, boys had higher energy-adjusted mean intakes of vitamin E (5.4 mg, 95%CI: 5.3; 5.5 vs. 5.1 mg, 95%CI: 5.1; 5.2), selenium (109 μg , 95%CI: 106; 112 vs. 93 μg , 95%CI: 91; 94), and zinc (15.6 mg, 95%CI: 15.4; 15.7 vs. 11.4 mg, 95%CI: 11.3, 11.6). Differences in micronutrient intake according to sex may be related to differences in the selection of food items, and consequently in diet quality and anti-inflammatory potential between boys and girls. Diet is an important factor in the prevention and control of metabolic changes related to chronic noncommunicable diseases. Thus, future studies should evaluate the association of the diet anti-inflammatory potential with indicators of weight condition and metabolic changes in the studied adolescents.

85. The Total Dietary Antioxidant Capacity and Their Seasonal Variability and Dietary Sources in Cardiovascular Patients *

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Introduction: The favorable role of dietary antioxidants on cardiovascular (CVD) diseases and protection is widely discussed, and the total dietary antioxidant capacity (TAOX) is perceived as a new diet-quality marker. Data concerning the TAOX and its dietary sources related to seasonal variability are limited. **Objectives:** We aimed to analyze the TAOX, seasonal variability, and sources in the daily diet of cardiovascular patients. **Method/Design:** We studied 143 subjects (82 men, 61 women) treated since cardiovascular problems for at least five years. A total of 143 seasonal recalls were collected regarding the intake of dietary sources of antioxidant compounds in spring, summer, autumn, and winter. A food frequency questionnaire was used. For each season, the total density of the antioxidant diet (Q-ORAC in $\mu\text{molTE}/1000 \text{ kcal}$) was calculated. Anthropometrics and body composition were evaluated. **Results:** The primary sources of antioxidants in cardiovascular patients diets were fruits (27%), vegetables (17%), and black tea (15%). The Q-ORAC of CVD patients' diets significantly depended on the season ($p < 0.001$) and were highest in the summer and lowest in the spring. The total antioxidant density of women's diets and consumption of dietary sources of antioxidants was not related to their physical activity and socioeconomic status. All subjects were characterized by seasonal variation in consumption, which was higher in women than men. **Conclusion:** Our findings suggest that a diet characterized by a total antioxidant capacity might be subjected to large fluctuations between seasons. We suggest considering modifying the dietary recommendations for cardiovascular patients on low antioxidant capacity seasons.

86. Andalusian Aging Wine Improves the Dietary Pattern and Intake of Micronutrients in Men with High Cardiovascular Risk

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Background: Beneficial effects of moderate consumption of alcoholic beverages, wine in particular, on the cardiovascular system have been attributed to the amount of alcohol intake, the non-alcoholic components of alcoholic beverages (polyphenols), but also to the dietary pattern followed, especially in wine drinkers. The aim of this study was to evaluate the changes in food and micronutrient intake in men with high cardiovascular risk included in a feeding trial. **Methods:** We embarked on a randomized crossover feeding trial with 40 male subjects at high cardiovascular risk. All subjects received either 0.30 g of alcohol/kg/day in the form of Andalusian aging wine (AAW) or gin. Advice to not change diet was given to the subjects at the beginning of the trial. Dietary intake (3-day food records) was assessed at the beginning and the end of each intervention period. **Results:** A total of 38 participants (95%) completed the trial. The mean AAW consumption per day was 255 mL and gin, 92 mL. Interestingly, after AAW intervention, participants significantly reduced consumption of fast food ($p = 0.013$) and high-fat fermented dairy products ($p = 0.029$) and increased in pulses ($p = 0.034$) compared to gin. However, an increased consumption of vegetables ($p = 0.046$) was observed after gin intake. On the other hand, after AAW and gin, intervention significantly reduced consumption of sweet foods ($p = 0.031$; $p = 0.040$, respectively). When analyzing micronutrient intake during the AAW period, participants increased consumption of vitamin B1, B3, and B6 ($p = 0.016$; $p = 0.018$; and $p = 0.027$, respectively) and zinc, selenium, phosphorus, and fluor ($p = 0.05$; $p = 0.010$; $p = 0.037$; $p = 0.001$, respectively). Vitamin C significantly increased during both intervention periods ($p = 0.026$, both). Nevertheless, a significant increase in chrome ($p = 0.001$) and a decrease in vitamin B8 ($p = 0.001$) were observed after gin intake. **Conclusion:** Recommendations regarding AAW intake induce the spontaneous displacement of unhealthy foods and increase the intake of vitamins and minerals.

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87. Annurca Apple Polyphenolic Extract Protects Hair Follicles from Chemotherapy-Induced Dystrophy

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Chemotherapy-induced alopecia (CIA) is a common side effect of conventional chemotherapy and represents a major problem in clinical oncology. Even months after the end of chemotherapy, many cancer patients, especially those affected by breast cancer, complain of hair loss, a condition that is psychologically difficult to manage. CIA disturbs social and sexual interactions and causes anxiety and depression. Nutraceuticals have been recently shown to be safe and effective treatment options for hair loss. However, their compatibility with chemotherapeutic drugs remains under debate. *Malus Pumila Miller* cv Annurca is an apple native species to Southern Italy presenting one of the highest contents of Procyanidin B2. We show here that polyphenols from *Malus Pumila Miller* cv Annurca are endowed with hair growth promoting activity and can be considered a safe alternative to avoid CIA. In vitro, Annurca apple polyphenolic extract (AAE) protects murine hair follicles (HF) from taxanes-induced dystrophy [1]. AAE forces HFs to produce ATP using mitochondrial β -oxidation, reducing the pentose phosphate pathway (PPP) rate and nucleotides production. As a consequence, DNA replication and mitosis are not stimulated, while a pool of free amino acids usually involved in catabolic reactions are spared for keratin production and hair growth [2]. The potency of commonly used chemotherapeutic agents Tamoxifen, Docetaxel, and Doxorubicin on MCF7 breast cancer cells is not influenced by AAE, that, on the contrary, is here proven to prime cancer cells for chemotherapy-induced death. Thanks to its mechanism of action, AAE is thus compatible with chemotherapy regimens.

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88. Antioxidant Effect of Date Seeds Powder, Extract, and Bread after an Acute Consumption in Humans

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Date (*Phoenix dactylifera* L.) is largely produced in the Middle East and consumed in different places in the world. Date seeds (DS) are a wasted by-product. Due to their great polyphenol content, they may exert antioxidant properties. However, human data are lacking. Our purpose was to determine if date seeds powder (DSP), extract (DSE), and bread (DSB) could exert a safe antioxidant effect in humans. A cross-over study was conducted in 16 adult healthy volunteers (8 female and 8 male). Two doses of each DS product were orally ingested by each volunteer, with a 2-week wash-out between each dose: 0.25 and 0.5 g/kg body weight DSP, 6 loaves (60 g each) of 10% and 15% DSB, and 30 and 60 mg/kg body weight DSE. Volunteers came to the hospital after 12 h fasting and after 2 days of low polyphenol diet and no practice of physical activity. Each dose was included into a breakfast covering 50% of the total daily energy needs. Water only was provided during the 8 following hours. Glucose, lipid profile, creatinine, albumin, urea, CK, LDH, and liver enzymes were measured, at baseline and 24 h, with COBAS. Glutathione, malondialdehyde, and protein carbonyl (markers of lipid and protein oxidative damages, respectively) were measured at baseline, 1, 2, 8, and 24 h. Means \pm s.d. were calculated. Comparisons were done with ANOVA, in SPSS v.25. Whatever the DS product and the dose, all biochemical parameters remained within the normal range. A nonsignificant glutathione increase was observed over 24 h. By contrast, after only 1 hour, malondialdehyde and protein carbonyl significantly decreased and returned to baseline value after 8 h. The safety of an acute consumption of DSP, DSE or DSB was confirmed in humans. The significant fast inhibitory effect on lipid and protein oxidative damages supports the benefits of consuming DS on human health.

89. Beneficial Effect of Isoorientin in Insulin-Resistant 3T3-L1 Adipocytes

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BACKGROUND: Obesity is a major causal factor for the development of cardiovascular disease and type 2 diabetes. Currently, various mechanisms are being targeted to ameliorate obesity. The ‘browning’ of white adipose tissue has become one of the integral processes explored for the potential treatment of obesity. Aspalathin, the major polyphenolic compound from rooibos, has been shown to exhibit anti-obesity and antidiabetic properties; however, less is known about its flavone oxidation products, orientin and isoorientin. This study aims to investigate the effect of isoorientin on obesity and especially explore its effect on browning of fat, mitochondrial function, insulin resistance, and lipid metabolism. **METHODS:** To achieve these specified aims, an in vitro adipose model of 3T3-L1 adipocyte was used. To determine the optimal concentration, matured adipocytes were exposed to various concentrations of isoorientin (0.1–100 μM) for 4 h. Based on glucose uptake and metabolic MTT activity results, an optimal concentration of 10 μM isoorientin was selected. To induce mitochondrial dysfunction and insulin resistance, cells were exposed to 0.75 mM palmitate for 24 h. Subsequently, cells were treated with isoorientin (10 μM) and positive controls such as CL316243, a selective β_3 -adrenoceptor agonist (1 μM), pioglitazone, an antidiabetic drug (10 μM), and compound C, an AMPK inhibitor (10 μM) for 4 h. Thereafter, glucose uptake, MTT, ATP, Oil Red O, glycerol release, and inflammatory markers (TNF α and IL6) were used to investigate the effect of isoorientin on obesity. **RESULTS:** The results showed that isoorientin enhanced glucose uptake, mitochondria activity, and ATP production in a dose-dependent manner in matured adipocytes. Palmitate induced insulin resistance, and mitochondrial dysfunction was ameliorated for glucose uptake MTT, ATP glycerol release, and enhanced lipid accumulation by isoorientin. **CONCLUSION:** Our data support the beneficial effects of isoorientin on modulating obesity under insulin-resistant conditions. However, molecular mechanisms involved in this process still need to be investigated.

90. Cytoprotective Properties of Fern Extracts against Oxidative Stress in 3T3 and HaCat Cells *

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Oxidative stress is one of the main factors promoting the development/progression of chronic diseases and particularly affecting skin aging. Natural polyphenols may play an important role in order to prevent an imbalance of redox homeostasis. Common sources of polyphenols are fruits, vegetables, medicinal plants or herbal teas. Nevertheless, very little is known in the case of ferns as potential sources of bioactive molecules to prevent oxidative stress for the treatment or prevention of certain diseases. Previous studies from our group have reported antioxidant and antityrosinase activity of fern extracts using in chemico models with potential applications in skin disorders. In this work, the polyphenolic profile of extracts of ferns known as *Asplenium trichomanes* and *Ceterach officinarum* as well as the cytoprotective activity against an oxidative insult were studied using the mouse fibroblasts 3T3 and the human keratinocyte HaCaT cell lines. The phytochemical characterization was done by HPLC-DAD; cytoprotective properties were evaluated using different extract concentrations (0.1 to 2 mg/mL) as pretreatments for 24 h and H₂O₂ (1 and 2 mM) as oxidizing agent. Neutral red uptake (NRU) and tetrazolium (MTT) assays were performed in order to determine cell viability. Effects on SOD and levels of ROS were also determined as indicators of antioxidant response by extracts. Fifteen polar compounds belonging to different groups were monitored for the two extracts. From a polyphenolic perspective, *C. officinarum* was rich in phenolic acids, whereas *A. trichomanes* contained more flavonoids. At the maximum concentration, extracts showed high levels of cellular viability. Both of them have demonstrated a cytoprotection capacity at 2 mg/mL against H₂O₂ (2 mM), increasing a 30% 3T3 cell survival for the MTT assay. Both extracts revealed interesting effects indicating its potential uses for pharmaceuticals, cosmetics or food supplements. Future work will concentrate on evaluation of potential photoprotective effects.

91. Effect of a Combination of Polyphenols Derived from *Hibiscus sabdariffa* L. and *Lippia citriodora* L. on Stage I Hypertensive Patients: A Randomized Controlled Trial

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High-normal blood pressure patients and grade 1 hypertension subjects are candidates to develop cardiovascular and renal events. Changes in certain lifestyle habits (increase of physical activity and balanced diet) are instrumental in preventing the onset of the disease. The consumption of certain natural hypotensive products might motivate patients to follow this preventive strategy. In this context, a combination of *Lippia citriodora* and *Hibiscus sabdariffa* extracts, rich in polyphenolic compounds, was used in a 6-week randomized, double-blind, placebo-controlled study with pre-hypertensive/grade 1 hypertension individuals. Anthropometric and blood parameters as well as punctual and continuous blood pressure monitoring were determined in placebo and experimental groups. Comparing the beginning to the end of intervention, volunteers consuming the polyphenolic extract showed a significant reduction of total systolic and diastolic pressures as well as in daytime diastolic, daytime systolic, night diastolic pressures, and in % dipper. Compared to the placebo group, consumption of the plant extract resulted in a significant reduction of body fat content as well as systolic night pressure and % dipper. These results suggest that the plant extract acts as a main regulator of the individual's blood pressure towards healthier values. This significant change may help and motivate individuals toward changes in lifestyle that include abandoning sedentarism and consuming balanced diets.

92. Effects of Aged Wine Consumption on Circulating Endothelial Progenitor Cells, Endothelial Dysfunction, and Cardiovascular Risk Factors in Men with High Cardiovascular Risk

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Introduction: Several epidemiological studies suggest that moderate alcohol consumption of wine has beneficial effects on cardiovascular (CV) risk, related to appearance and progression of the atherosclerosis. No previous studies have analyzed the beneficial effects of aged wine (AW) on circulating endothelial progenitor cells (EPC), endothelial dysfunction, and CV risk factors.

Objective: The aim of this study was to evaluate the effects of AW and gin (G) on circulating EPC, CV risk factors, and endothelial dysfunction at subjects at high risk. **Methods:** In an open, randomized, controlled, and crossover trial, a total of 38 high-risk male volunteers aged between 55–80 years received, at random, 30 g of ethanol per day in the form of AW or G for 3 weeks. After a run-in period and after the interventions, we assessed changes on the expression of EPC, nitric oxide (NO) levels, and CV risk factors. **Results:** After consumption of AW, expression of circulating EPC was significantly increased by 39.63% ($P = 0.03$), as well as levels of NO by XX% ($P = 0.013$). Classical CV risk factors as systolic and diastolic blood pressures ($P \leq 0.033$; both), HDL-cholesterol ($P < 0.05$) and apolipoprotein A ($P = 0.001$), and glucose metabolism (plasma insulin concentration ($P = 0.002$) and HOMA-IR ($P = 0.049$)) improved after intake of AW. Further, novel CV risk factors as ICAM-1 and VCAM-1 were significantly reduced after consumption of AW ($P \leq 0.020$; both). **Conclusion:** AW showed a higher ability to repair and maintain endothelial integrity, as well as a higher efficiency in avoiding endothelial dysfunction than gin.

93. Polyphenols as Specific Modulators of Master Regulatory Cellular Reactions. The Tale of Procyanidin B2 and Mitochondria

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Polyphenols have shown their nutraceutical potential in many human conditions and their efficacy in a plethora of different biological contexts. In the last decade, our group has extensively worked with nutraceuticals enriched in catechin, epicatechin, and procyanidin B2. We have proved these active nutraceuticals in the most surprisingly different biological scenarios. When made bio-accessible by inclusion in gastro-resistant capsules and administered to humans, these: (i) lower blood cholesterol levels, triglycerides, and LDL [1,2]; (ii) act as hair growth promoters and protect hairs from chemotherapy-induced alopecia [3,4]; (iii) preserve brains from ischemic reperfusion injuries [5]; and (iv) act as inhibitors of cancer cell proliferation [6]. The results presented by the scientific community confirm our data and suggest even more activities for these polyphenols. A question should thus necessarily arise: How can these act as “panacea” for every human biological condition? We here propose that the different effects exerted by catechin, epicatechin, and procyanidin B2-enriched nutraceuticals can be ascribed to a main specific mechanism, i.e., a ubiquitous modulation of mitochondrial activity. We show that these polyphenols permeate the plasma membrane of human cells and reach the inner mitochondrial membrane. As first, they act in a Coenzyme Q-like fashion, facilitating electron transport along the membrane and H⁺-pump activity, overall promoting oxidative phosphorylation and mitochondrial ATP production. As a consequence of this increased mitochondrial activity, the metabolism of human cells changes. Catabolic reactions (necessary to fulfill mitochondrial requirements for intermediates) are favored over anabolic ones. The rate of fatty acid β -oxidation, glutamine conversion to alpha-ketoglutarate, Krebs Cycle all increase, while biosynthesis of lactate, cholesterol, and nucleotides is disfavored. Such profound change in the cell metabolism helps to explain, support, and predict the outcome of polyphenols containing nutraceuticals consumption in humans.

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94. Polyphenols from Grape By-Product Improve Endothelial Function Evaluated by Flow-Mediated Dilatation (FMD): Preliminary Results

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A large body of evidence proposed polyphenols-based nutraceuticals for endothelial function (EF) control. In particular, studies suggested that both grape-derived polyphenols and resveratrol significantly improve the EF evaluated by flow-mediated dilatation (FMD). In the present study, we evaluated the efficacy of a novel nutraceutical formulation based on grape pomace polyphenolic extract (registered as Taurisolo[®]) in improving EF in 10 healthy subjects randomized into two groups: Taurisolo[®] 500 mg twice daily (group A) and placebo 500 mg maltodextrins twice daily (group B). As a primary outcome, we evaluated the EF by measurement of FMD and reactive hyperemia index (RHI) before and 1 h after ingestion of 1000 mg Taurisolo[®] or placebo (t_0 and t_1 , respectively) and after 8-week treatment (t_{8wk}). As secondary outcomes, the serum levels of D-ROMs and oxidized-LDL (oxLDL) as oxidative stress-related biomarkers were monitored at t_0 and t_{8wk} . Data herein present are part of an ongoing clinical trial involving 30 healthy subjects. In acute cases, FMD significantly increased in group A (94.6% t_0 vs. t_1 , $p = 0.03$ and 2.89% t_0 vs. t_1 , $p = 0.938$, group A and group B, respectively). Among the study participants, 5 subjects completed the 8-week treatment with 500 mg Taurisolo[®] twice daily. After the treatment period, we observed significantly increased FMD (117.5% t_0 vs. t_{8wk} , $p = 0.02$) and RHI (31.53% t_0 vs. t_{8wk}). Furthermore, we found significantly reduced serum levels of the monitored oxidative stress-related biomarkers (D-ROMs, -34.60% t_0 vs. t_{8wk} , $p < 0.0001$; ox-LDL, -48.64% t_0 vs. t_{8wk} , $p = 0.001$). According to the available literature, our observed results may be mainly justified by both a significant reduction of the oxidative stress and a possible increased endothelium-derived NO bioavailability. In summary, preliminary data herein presented suggest Taurisolo[®] as a potential nutraceutical supplement for control of EF in healthy subjects.

95. Taurisolo, a Grape Pomace Polyphenolic Extract, Reduces In Vivo Trimethylamine N-Oxide Blood Levels by Reprogramming Hepatic and Intestinal Lipid Metabolism

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Cardiovascular disease (CVD) is a leading cause of death worldwide. The increase of Trimethylamine N-oxide (TMAO) blood levels is nowadays considered a risk factor for CVD. Several meta-analyses of prospective cohort studies indicate that higher plasma TMAO correlates with a 23% increase in risk for CV events, as well as a 55% increase in all-cause mortality. Reduction in TMAO blood levels represents one of the therapeutic goals to achieve in order to reduce the occurrence of CVD. Achievement of this goal is currently being attempted by promoting healthy lifestyle behaviors and low-fat diets. Recently, several nutraceuticals have been shown to possess TMAO-lowering properties and are becoming common over the counter products. Among others, Grape Pomaces, in virtue of their high content of Resveratrol, efficiently reduce TMAO serum levels in humans. We have published the results of a randomized, placebo-controlled, cross-over trial, carried out to evaluate the TMAO-reducing effect of Taurisolo, a Pomace extract from Aglianico Grapes, a wine cultivar native to Campania (Southern Italy), upon either acute or chronic treatments. Both the conditions have been shown to reduce the levels of TMAO [1]. Despite the in vivo effect of Grape Pomaces, the analysis of the molecular mechanism behind their activity is under debate and seems not to be solely attributable to their Resveratrol content. Here, using high-resolution mass spectrometry approaches, we analyzed the molecular mechanism underpinning the metabolic effect of Taurisolo in in vitro cultured cells as well as in vivo, in C57BL-6J mice. Our results showed that the polyphenolic fraction of Taurisolo drastically reprograms lipid metabolism in vitro and in vivo and, more than Resveratrol, it is the main responsible factor for the TMAO-lowering activity of the nutraceutical.

References:

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96. Reproducibility and Validity of a Short Survey to Assess Food Quality Consumption

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Food quality intake assessment allows for delivering recommendations to improve the population's diet. Considering this, it is essential to validate the tools to assess and diagnose the quality of food intake. The aim was to determine the reproducibility and validity of the second version of the Mini-Survey to Evaluate the Quality of Food Intake (Mini-ECCA v.2, by its initials in Spanish). This survey has 14 questions with 3–4 answer options about frequency and quantity of consumption of food groups or beverages; it also includes photographs to support food quantity estimation. The questionnaire was applied by an audience response system (SUNVOTE V3.1.0.20), two times (test-retest) with 4 weeks of separation, to University of Guadalajara's health sciences students (October 2017–May 2018). Reproducibility was calculated by a weighted kappa in each Mini-ECCA question. Validity was determined by cluster analysis with city block distance and Ward's method none standardized, an ANOVA ($p < 0.05$) by each item of the survey with the identified clusters, and discriminant analysis. We included 276 students (mean age = 20.1 SD 3.1 years; 68% women). The reproducibility and concordance from each question were from moderate (weighted $k = 0.422$ – 0.585) to excellent (weighted $k = 0.606$ – 0.662). Three groups were obtained from cluster analysis: (1) food consumption considered as healthy (19.9%), (2) food consumption to enhance (47.1%), and (3) nonhealthy food consumption (33%). In addition, this analysis demonstrated that 85.7% of individuals were correctly classified: cluster 1: 96.4%, cluster 2: 78.5%, and cluster 3: 90.1%. Vegetable consumption (classification function coefficient = 8.63136) explained better the differences between clusters, followed by water intake (6.2692). As a conclusion, Mini-ECCA v. 2 has excellent reproducibility and concordance, and it is a tool with an acceptable validity to assess food intake quality in adults.

97. Dietary Determinants of Obesity and Metabolic Health in Kandahar, Afghanistan: Study Protocol of a Cross-Sectional Study and Preliminary Results

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Introduction and Background: Obesity is a major health problem worldwide, and its prevalence is also increasing in Afghanistan. Due to rapid economic, social, and cultural changes in Afghanistan, dietary patterns are shifting from the traditional pattern to a more Westernized pattern, with a marked increase in consumption of energy-rich foods, leading to noncommunicable diseases. It is therefore important to determine the role of dietary patterns, physical activity, and other factors in the development of obesity and poor metabolic health in this population. **Aims:** The hypothesis is that specific lifestyle factors and dietary patterns, and characteristics of Westernization are associated with an increased risk of being overweight or obese and with poor metabolic health. **Methods and Data Collection:** A population-based cross-sectional study of about 750 male and female participants, aged 20 to 75 years, was conducted in Kandahar city. Participants were interviewed directly using standardized questionnaires on sociodemographic characteristics, health history, physical activity, and diet. Anthropometric measures were performed by trained staff. Bioelectric impedance analysis (BIA) was used to estimate body fat composition. Study participants also provided blood, urine, and stool samples for future biomarker analyses, including metabolic, inflammatory, and immune markers, dietary biomarkers, and metabolomics. **Results:** The study is currently at the final stage of data collection ($N = 700$), and the first descriptive results will be presented during the conference. **Conclusion:** The findings will provide evidence to help to form public health strategies to reduce and prevent obesity and related chronic diseases in Afghanistan and promote a healthy lifestyle. The data collected will constitute an invaluable resource for future studies on biomarkers and microbiome and could be used to train future epidemiologists and public health scientists in Afghanistan.

98. Total Energy Expenditure Estimated by Means of SenseWear Armband Pro3 in a Spanish Sample of Overweight and Obese Subjects: Screening Energy Expenditure Phenotypes for a Precision Nutrition

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Introduction: The practice of a precision nutrition requires compiling genotype and phenotype data. TEE estimation is a key variable due to its intersubject variability. The most used methods in a clinical setting are the factorial and the MET. However, the former is prone to bias inherent in the REE prediction equation and the subjectivity of PAL factor allocation, and the latter to the patient memory bias. SenseWear Armband Pro3 (SWA Pro3) is a metabolic monitor made up of several technologies, which has been validated against an open circuit IC to estimate the TEE in healthy subjects at low intensities and physical exercise up to an intensity of 10 METs and overweight and obese people. **Objectives:** The aim was to estimate the TEE in a Spanish sample of overweight and obese subjects, classifying them by sex and age, who attend a Dietitian-Nutritionist (D-N) private office. **Material and methods:** Cross-sectional study performed in a Spanish sample ($n = 80$) made up of 53 women (52 ± 13 years; $BMI = 31 \pm 5.5$ kg/m²) and 27 men (48 ± 13 years; $BMI = 31.7 \pm 4.1$ kg/m²). Inclusion criteria were sedentary adults (>18 years old) with a BMI 25. Participants were asked to bear the SWA in the triceps for six days, except for washing up, at least 23.5 h/day. **Conclusions:** The wide average SD (356) of TEE discloses the huge intersubject variability and lays bare the urge to estimate with precision that one. A total of 96% of men ($n = 26$) and 43% of women ($n = 23$) had a TEE > 2300 Kcal. Therefore, the arbitrary allocation by the Spanish National Health System of 1500 and 1800 Kcal diets to subjects in order to lose weight entails an energy restriction higher than the 25%–40% recommended by scientific societies. The inclusion of the professional figure of D-N in the NHS would contribute to the practice of precision nutrition that would improve the quality of health care.

99. Assessing Food Sustainability in Gran Canaria: Food Choices, Health, and Environment

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Background and Objectives: Environment and nutrition have traditionally been treated as separate fields in the community. The objective of this research is to determine the knowledge of the population about the importance of food and its connection with the environment. **Method:** A "Food Consumption and Sustainability Survey" was designed to collect sociodemographic data, information about the preferred place for purchasing food, the method of transport used to make the purchase, purchase preference according to whether the food is fresh or preserved, and the bags used to transport the purchase (plastic or made from other materials). Another section gathered data about frequency of purchase and the preferred place of purchase for various types of food. Information was also collected about the type of food purchase with regard to local consumption and/or ecological consumption, variation in purchasing habits due to awareness of sustainable and healthy food and sustainable and fair trade food production, and the respondent's opinion about the importance of transgenic crops and home-produced food. A total of 225 surveys were collected. **Results:** Of the total people surveyed, 58.2% indicated that they rarely or never consider the environmental impact of consuming. When asked about the reasons for not consuming local food products, 22.6% of the study population considered local products were very expensive and 39.6% cited insufficient availability in the places where they usually purchase food. With regard to recycling of waste materials by type, the percentages were: plastic (80.9%), glass (81.7%), paper and cardboard (76.3%), oil (50.4%), and batteries (82.4%). **Conclusions:** It is necessary to improve the knowledge of the population about the importance of the environmental impact of consuming and to promote more sustainable consumption models.

100. Assessment of the Intake of Vitamin K and Calcium among Children with Gastrointestinal Disorders in Relation to a Healthy Population

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Vitamin K as the γ -carboxylase cofactor and calcium takes part in bone metabolism. Children's requirements for these nutrients are among the greatest, and insufficient dietary intake may have an impact on peak bone mass appearance time as well as on osteoporosis risk in adulthood. Pediatric patients with inflammatory bowel disease (IBD) seem to be prone to deficiency due to ongoing inflammation. The goal of the study was the assessment of nutrient intake, especially vitamin K and calcium in children's diet in a population with gastrointestinal disease (IBD) in comparison to healthy children. A pilot study consisted in total of 52 children, including 25 children with IBD in clinical remission and a comparable sample of 27 healthy children. The mean age for both groups was 12 years. An FFQ was used to assess eating habits, and nutrient intake was assessed using data obtained from the dietary records provided by the parents. In both groups, low intake of vitamin K was observed, on average 39.21% (children with IBD) and 32.23% (healthy children). Low intakes of good sources of vitamin K, such as vegetables and dairy products, were observed in both groups. Vegetables were eaten on average with a frequency of one a day, while green vegetables, being a good source of vitamin K (K1), in both groups were eaten on average once a week. Fermented milk products in both groups were eaten on average several times a week. In both groups, very low calcium intake from diet was observed, significantly lower in the IBD group ($p < 0.0026$). Low consumption of dairy products (vitamin K2 and calcium) and vegetables (vitamin K1), translating into lower than recommended intake of vitamin K and calcium in children with higher demand, increases the risk of developing subclinical deficits, which may be reflected in the skeletal system.

101. Association between Dietary Intake and Use of Dietary Supplements among Female Japanese Nurses

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Background and objective: People commonly use dietary supplements to maintain and enhance their health. However, it is questionable whether those who use them have lower-than-recommended dietary intakes of what they are supplementing. This study aimed to determine the association between dietary intake and use of dietary supplements, using data from the Japan Nurses' Health Study (JNHS), a large cohort study. **Methods:** The subjects were 11,280 female Japanese nurses aged 28–81 years. Their dietary intakes of calcium, iron, and vitamins were assessed using a food frequency questionnaire. Logistic regression analyses were conducted to examine the association between these intakes and dietary supplement use, along with the characteristics of supplement users. **Results:** The prevalence of users of calcium, iron, and vitamin supplements were 7.2%, 5.1%, and 22.6%, respectively. Being older (≥ 65 years) and having a lower body mass index (18.5 kg/m^2) were significantly associated with calcium supplement use. Women with lower dietary calcium intake also had lower prevalence among calcium supplements users. Iron supplement use was significantly associated with menopause status and had no significant association with dietary iron intake. Vitamin supplement use was significantly associated with lower body mass index, and those with higher dietary vitamin intake had higher prevalence among vitamin supplement users. **Conclusion:** Association between dietary intake of nutrients and use of dietary supplements considerably differ among calcium, iron, and vitamin supplement users. Additionally, the characteristics of supplement users differ.

102. Association between Macronutrient Intake and Herb and Spice Consumption in Young Adults Living in Two Mediterranean Countries

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The healthy benefits of the Mediterranean diet are attributed to different components of this food pattern, including the profile of nutrient components as well as non-nutrient components. Bioactive components available in Mediterranean typical herbs and spices involve a high antioxidant capacity related to the prevention of chronic diseases. Transition to Western dietary patterns affects macronutrient consumption. However, little is known about how these changes influence the intake of herbs and spices. Young adults are especially sensitive to change forward to a Western food environment. The aim of this work was to identify modifications of consumption patterns of macronutrients affecting pattern intake of herbs and spices. A cross-sectional study was conducted on a sample of 404 students enrolled at the University of Castilla-La Mancha (Spain) and the University of Carthage (Tunisia). Food consumption was self-reported in two 24-h recalls. Statistical analysis was performed with IBM SPSS 24. Spearman's correlation was applied to identify associations of macronutrients, fiber, and energy with herbs and spices.

Our results showed that high protein intake was significantly associated to low intake of herbs-spices in Spanish students. However, high protein intake was significantly associated to high intake of herbs-spices in Tunisian students. In both populations, fiber consumption was positively associated with herbs-spices consumption, and trans fatty acids intake was negatively associated with herbs-spices consumption. Therefore, decrease of the bioactive components of the diet is associated with high intake of animal protein and trans fatty acids as well as the decrease of fiber intake linked to Western patterns. The variety of consumed herbs and spices was higher in Tunisian students, and this consumption was also higher in this group ($p < 0.001$). On the other hand, the intake of herbs and spices did not show significant differences when anthropometric and lifestyle characteristics (gender, BMI, physical activity, and smoking habits) were considered.

103. Beverage Consumption Patterns and Diet Quality among Urban and Rural Schoolchildren: Is Milk and Sugar Sweetened Beverage Consumption Associated to Diet Quality?

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Introduction: Beverage consumption (BC) among children can be indicative of total diet quality (DQ) and malnutrition. In México, the last national survey reported high sugar-sweet-beverage consumption, and 33.2% of obesity-overweight prevalence in schoolchildren. The aim of this study was to describe the association between BC and DQ in Mexican schoolchildren. **Materials and methods:** A longitudinal study was conducted in 353 rural or urban children aged 6–12 years old based on at least one three-day-recall (3D-r) during a year. Beverages portions were calculated according to equivalents to the Mexican food system. Three predefined beverage-consumption patterns (BCP) were used to classify children considering high intakes of milk, juices, and soft drinks: (1) only-milk pattern, (2) only-juices-soft-drinks pattern, and (3) both-milk-juices-soft-drink pattern. The DQ score was calculated according to tertile distribution of BC and eight food-groups derived from 251 food-items. Dietary components of interest were energy (kcal), calcium, vitamin D, vitamin A, vitamin C, potassium, and fiber. Additionally, we compared nutritional status using body mass index (BMI) categories by BCP between rural and urban children. Pearson or Spearman correlation coefficients and Chi-square tests as well as regression models adjusted for gender, community, and total energy were used. **Results:** Most children (72%) drank both milk-sweet-sugar beverages. Skimmed, semi-skimmed milk, whole milk, sugar-sweetened beverages and fruit juices consumption was higher in urban children ($p < 0.05$). There were no differences between urban and rural children in diet quality. Drinkers of both milk and sweet-sugar beverages had higher energy intake. In overall diet, urban children had higher intakes of energy, calcium, vitamins D, A, and potassium. Rural children presented higher intakes of iron and fiber ($p < 0.05$). Drinkers of both milk-sweet-sugar beverages pattern had the highest DQ score. Overweight-obesity prevalence was higher in BCP-3. **Conclusions:** The sugared milk and sweet-sugar beverages pattern is the most frequent beverage pattern in rural and urban schoolchildren. DQ does not differ between the three patterns; however, it is lower in rural children.

104. Determinants of Salt Use in Diet of Toddlers Aged 12–36 Months in Two European Countries

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Children may have a higher preference toward salty taste than adults. It was discussed whether delaying the introduction of salty foods to children can lower their preference for salty taste and help to build healthier nutritional behaviors. The aim of this study was to investigate the associations between salt usage in diets of toddlers and maternal factors and early nutritional practices in Poland and Austria. This anonymous, cross-sectional internet-based study was conducted in 2018 and 2019 among 6645 mothers of children aged 12–36 months, recruited through social media. Analysis included complete data from 5893 mothers (69.7% from Poland). Mothers were asked about early nutrition of their infants and toddler nutrition in the previous three months, including the usage of salt during meal preparation and at the table. The statistical analysis included a multivariate logistic regression. On average, salt was added to meals in 67% of toddlers, with a higher percentage found in Austria than in Poland (81 vs. 60%, $p \leq 0.001$). An earlier introduction of complementary feeding, a higher percentage of traditional spoon-feeding practice and of using ready-to-eat infant food during complementary feeding, as well as lower rates and duration of breastfeeding were observed within the salt consumption group. Moreover, in the “salt users” group, a higher percentage of mothers had lower education level, were multiparas, lived in rural areas, and had a lower monthly income. The risk of usage of salt decreased when toddlers were complementary fed with the BLW method (aOR 0.78, 95%CI 0.63–0.96) and with food cooked specially for them (aOR 0.85, 95%CI 0.74–0.99), living in an urban area (aOR 0.75, 95%CI 0.66–0.86), and toddlers were still breastfed (aOR 0.48, 95%CI 0.42–0.55). This risk increased when the mother was a multipara (aOR 1.68, 95%CI 1.48–1.90) and had a vocational education (aOR 1.54, 95%CI 1.14–2.10). The BLW method of complementary feeding and breastfeeding was associated with subsequent lower salt usage.

105. Determination of the Association between Dietary Intakes Determined in Two Nonconsecutive Days, Healthy Eating Index, Diet Quality Index, and Mediterranean Diet Quality among Adolescents

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In this study, diet quality among adolescents was evaluated using the Healthy Eating Index (HEI-2010), Diet Quality Index (DQI-I), and Mediterranean Diet Quality (KIDMED). The study was conducted on a total of 200 adolescents (boys: 62, 31.0%; girls: 138, 69.0%), aged 15–18 years, in Kilis, Turkey. Using a questionnaire, general characteristics, nutritional habits, 24-hour dietary intake recall, food consumption frequency, physical activity status, anthropometric measurements, and body composition were determined. Percentages of obesity among boys and girls were 4.8% and 8.7% and overweight were 8.1% and 15.9%. HEI-2010, DQI, and KIDMED scores were calculated depending on 24-h dietary recall (24-hDR) on two randomly-selected nonconsecutive days (a 14-day interval). None of the adolescents had a good dietary quality (HEI score: ≥ 80). Mean HEI-2010 score of 1st (baseline) and 14th days was 46.2 for boys and 48.7 for girls and out of the total, 49.5% had diet quality determined as poor (50 points). Total fruit, whole fruit, and total vegetable scores were found statistically significant ($p < 0.05$, $p < 0.01$) according to gender and higher in girls. Mean DQI-I score of 1st and 14th days was 50.7 for boys and 45.5 points for girls out of 100. Total vegetables, total grains, fiber, protein, total fat, saturated fat, fatty acids, and total DQI were found statistically significant ($p < 0.01$, $p < 0.05$) according to gender. Protein score was higher, while total vegetable, fiber, total fat, saturated fat, fatty acids, and total DQI-I scores were lower in girls than in boys. Mean KIDMED score of adolescents was found to be 4.1 ± 2.33 (boys: 4.4 ± 2.43 , girls: 3.9 ± 2.27) points. It has been determined that the adolescents' diet quality is not good, so nutrition intervention and promotion programs should be implemented.

106. Effects of Sugar in Fruit Matrix Compared to Processed Sugar in Mice

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Objective: The dramatic rise of adiposity has seemed to correlate with an increased sugar intake over the last few decades. The question is whether sugar in fruit has the same effects as processed sugar, since not only the consumption of sweets but also of fruit has increased. Here, we investigate the effects of sugar in fruits compared to processed sugar on food intake, the gastrointestinal tract, and the liver in mice. **Methods:** Five groups of C57BL/6J mice ($n = 6-10$ per group) were fed diets containing 60% raisin or dried mango and diets with the equivalent amounts of processed sugar for mango and raisin diets as well as a standard diet ad libitum for eight weeks. Calorie, chow, and liquid intake as well as body weight gain were monitored. mRNA expression (RT-PCR) of the weight-regulating hormones ghrelin, CCK, PYY, and nesfatin1 was determined in the duodenum. Furthermore, protein concentration of intestinal tight junctions occludin and claudin1 as well as liver weight and hepatic lipid accumulation were investigated. **Results:** Caloric intake was elevated by each of the four sugar diets compared to the standard diet (all $p < 0.05$). No significant effect between sugar in fruit and processed sugar was found regarding the intestinal expression of weight regulating hormones and tight junction proteins. However, hepatic triglycerides and fat accumulation seem to be increased in diets with sugar in fruits compared to diets with processed sugar ($p < 0.05$). **Conclusion:** Increased dietary sugar concentrations augment food intake and induce intestinal and hepatic changes relevant for body weight regulation. We show that processed sugar and sugar in fruit matrix both increase body weight gain. Interestingly, sugar in fruit matrix seems to trigger hepatic fat accumulation more than processed sugar. Whether this is related to fruit components such as fruit acids needs further investigation.

107. Estimation of Sugar Intake and Validation Study for a Self-Administered Food Frequency Questionnaire Using Urinary Sugar in Middle-Aged Japanese Adults

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Although the burden of high intakes of sugars (mono- and di-saccharides) on chronic disease is drawing attention, evidence about the consumption and health impact among Japanese is scarce. Thus, we evaluated the validity and reproducibility of estimated sugar intakes using a food frequency questionnaire (FFQ) among middle-aged Japanese adults in the Japan Public Health Centre-Based Prospective (JPHC) study. In subsamples of the JPHC study (Cohorts I and II in multiple areas), we estimated sugar intakes and main food sources. We also computed Spearman's correlations of FFQ results with urinary concentration of fructose and sucrose as an objective biomarker and DR for validity, and correlations between two FFQs for reproducibility. In 1994–1998, participants (Cohort I: $n = 27$ (men), $n = 45$ (women)) provided two (spring and fall) 24-h urine samples and completed 7 consecutive-day DRs per season (I: $n = 99$, $n = 113$; II: $n = 168$, $n = 171$) and two FFQs (147 food items) at yearly intervals (I: $n = 101$, $n = 108$; II: $n = 143$, $n = 146$). The mean (standard deviation) of %energy for total and free sugars from DR was 9.5% (3.3%) and 3.9% (2.3%) for men ($n = 276$) and 13.6% (3.2%) and 5.9% (2.3%) for women ($n = 289$). Contribution proportions of fruits were the highest for sugar intake in both men and women. Sugar intakes from FFQ were correlated with urinary sugar (de-attenuated correlations: 0.40; 95%CI: 0.19, 0.58). Correlations between FFQ and DR for men and women in each cohort ranged from 0.34 to 0.57, and correlations between two FFQs ranged from 0.55 to 0.66. In conclusion, our study showed moderate FFQ validity and reproducibility for sugar intake evaluation.

108. Family Food Cultures in the Communities and Socioeconomic Transition in the Pacific: A Qualitative Approach on «Ating Well» in New Caledonia

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Objectives: In recent decades, the food cultures of the Pacific populations have undergone a sharp transition, particularly caused by the fact that trade exchanges with Western countries facilitate access to a wide range of processed foods. This already has a major impact on chronic diseases as they will develop in the next decades, since today, 35% of 11–16-year-old New Caledonian adolescents are overweight or obese. The aim of this qualitative study was to understand how “eating well” could be defined in the family context and more largely to know current food practices and representations in families according to their communities (Melanesian, Polynesian, and European). **Methods:** A total of 30 families (including 30 parents and 30 adolescents) from rural and urban areas were interviewed (face to face); the socioeconomic status of families and ethnicity were considered. Body composition of children was measured individually. **Results:** Food practices and “eating well” were related to food availability in the family (i.e., having a garden at home and being involved in family farming), socioeconomic status, and ethnicity. In addition, access to nutritional information of food and the role of food socialization between parents and children impacted food practices and representations (what is “eating well”, “good food”). Overweight and obesity affected 30% of the adolescents. **Conclusions:** This qualitative study shows the importance and the structure of the food culture in families living in rural and tribal areas. This is expected to play a key role in the fight against NCDs in the Pacific region. The positive perception of “traditional and local food” as “organic food” may help government authorities to address the population with a clear message to reach a sustainable food system. In addition, educational food programs, with a special focus on youth, are strongly recommended.

109. Nutrient Intake and Phase Angle in a Sample of Triathletes

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The aim of this study was to investigate the association between nutrient intake and phase angle (PhA) in triathletes contesting in Olympic-distance triathlete events. PhA is a bioimpedance parameter that is suggested to be a good indicator of cell membrane integrity and health. PhA was measured by a BIA phase-sensitive system (50 kHz, Akern). Nutrient intake was calculated from 24-h dietary recalls collected on 7 training days. Thirty-five Polish male triathletes participated in this examination. They were divided into two groups obtained due to the medium PhA. The division was based on segmental regression. Differences in mean values in these two groups (A and B) were calculated based on the Student's *t*-test for unrelated variables. Statistical analyses were performed using the "stat" and "segmented" libraries in the R software (version 3.5.3). There were no differences in age (mean age 35.3 ± 7.2 years) and BMI (mean BMI 23.9 ± 1.08) between the groups. Mean PhAs were 6.52° in group A and 7.56° in group B. The percentage of daily energy from digestive carbohydrates was higher in group B (58.8% vs. 45.98%), whereas for group A, a higher percentage of energy from fats was observed (36.05% vs. 25.94%). Athletes from group B consumed significantly more carbohydrates per kg of body mass (6.28 g vs. 4.3 g) as a result of higher intake of starch ($p < 0.05$). Higher consumption of both saturated and monounsaturated fatty acids was observed in group A ($p < 0.05$). Higher consumption of vit B1, vit B9, vit D, magnesium, iron, potassium, and copper was found to be correlated with higher PhA ($p < 0.05$). Vitamin D intake was below referenced values (RDA) regardless of the PhA value. In conclusion, carbohydrates could be reported as a macronutrient positively associated with PhA, and a higher quality of diet decreases the odds for a low phase angle.

110. Nutritional Status and Diet of Cancer Patients—Preliminary Results

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The nutritional status of the human body, defined as a set of morphological, biochemical, and functional features directly or indirectly dependent on nutritional factors, plays a fundamental role in maintaining health and its integrity. Changes in nutritional status in oncological patients occur at different frequencies, depending mainly on the type, stage, and location of the neoplasm. During diagnosis, patients with hematological neoplasms usually present the normal nutritional status. The aim of the study was to analyze the nutritional status and diet of patients with lymphoproliferative neoplasms before chemotherapy. Thirty-two patients with diagnosed lymphoproliferative neoplasm (MM, NHL, CLL) were included in this study. The study consisted of five stages, and the database included sociodemographic, biochemical, clinical, and nutritional features of the patients. The median age of patients was 63 years (range: 20–82), with $\frac{3}{4}$ of them were male. Patients did not use diet therapy. The mean concentration of albumin was 4.04 g/dL; transferrin 2.24 g/L; ferritin 327.98 ng/mL and did not indicate a risk of malnutrition; the exception was total cholesterol—159.19 mg/dL. However, if you look at the range of their values, you can notice significant differences and decreases below the norm, e.g., albumin levels 3.5 g/dL observed in 18.75%, and anemia 10 g% in 31.25% of patients. In 62.50% of patients, there was excessive body weight, which was indicated by average anthropometric indicators (BMI = 27.00, WHR = 0.97, WHtR = 57.00) and the results of the body composition analysis. In addition, the majority of respondents in their diet included too small amounts of wholegrain cereal products, vegetables, fruits, and fish and too much sweets. Despite the numerous abnormalities observed during the analysis of the diet of patients with lymphoproliferative neoplasms and the associated suspicion of the existence of qualitative malnutrition, the nutritional status of most patients before the oncological treatment implementation was normal.

111. Relationship between Specific Dietary Patterns and Serum Adiponectin Levels in a Mexican University Student Population

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Background: Mexico has undergone a nutritional transition characterized by overweight and metabolic diseases. Dietary patterns consistent with high processed products, deficient in nutrients and easily accessible, promote greater adiposity and lower adiponectin (AdipoQ) levels. Insulin-sensitizing and anti-inflammatory effects have been described for AdipoQ. University student populations are prone to high metabolic abnormality risks due to their unhealthy lifestyle. Hence, the relationship between following specific eating patterns and adiponectin levels could contribute to finding preventive measures to avoid metabolic diseases. **Objective:** To analyze the relationship between specific dietary patterns and serum adiponectin levels in a university student population from CUAltos, University of Guadalajara, Jalisco, Mexico.

Materials and Methods: Cross-sectional study in which the dietary intake patterns for each student were evaluated with a direct register of eating patterns (NutrikalÒ software). Serum AdipoQ levels were quantified using ELISA test (BiolegendÒ) after night fasting. The data were analyzed with the SPSS v.22. **Results:** In total, 175 university students were recruited. Gender distribution was 80% ($n = 140$) women and 20% ($n = 35$) men. The age average was 19.4 ± 1.6 years, and the mean for body mass was 22.8 ± 4.1 Kg/m². Additionally, the total energetic consumption average was 1942.36 ± 696 Kcal/day, with a distribution for macronutrients that was 16.7% protein, 35.3% fat, and 49.8% carbohydrates. Regarding AdipoQ serum levels, there was a significant difference by gender ($p = 0.01$) and vitamin B₂ consumption ($p = 0.047$). Furthermore, lower AdipoQ serum levels were observed in students with higher consumption of dairy products ($p < 0.020$). **Conclusions:** In this population, a significant relationship between the female gender and higher AdipoQ serum levels was found. Additionally, vitamin B₂ and dairy product consumption were related with AdipoQ levels. These findings confirm the relationship between dietary patterns and serum adiponectin levels in a Mexican university student population. Clearly, it is important to promote healthy eating patterns to prevent metabolic diseases.

112. Selected Lifestyle Features and Nutritional Status of Adolescents from Southern Poland

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One's lifestyle determines the state of their health. The aim of the study was to evaluate selected aspects of lifestyle and nutritional status of adolescents from Southern Poland (Lesser Poland province). A retrospective observational study was conducted in 2016–2019, among 412 adolescents (49.0% boys, 51.0% girls) aged 13.35 ± 1.92 years (Bioethical Commission consent No. 122.6120.217.2015). An anonymous questionnaire on dietary habits, lifestyle, and nutrition knowledge assessment (KomPAN) was used. Anthropometric measurements were carried out together with the analysis of body fat composition (BF%). BMI interpretation was based on OLAF centile charts. To examine the relationship of selected lifestyle features with the state of nutrition, χ^2 test and analysis of variance (ANOVA) was used. Normal body weight was characteristic for 60.7%, underweight for 15.8%, and overweight and obese for 23.5% (Overweight and obesity-based BMI = OOBMI; 31.2% boys and 16.2% girls, $p = 0.0004$) of the respondents according to BMI, whilst the percentage of body fat analysis showed that 16.3% of all the respondents were overweight or obese (overweight and obesity-based body fat = OOBF%; 12.8% of boys and 18.5% of girls, $p < 0.0001$). In the study group, overweight and obese adolescents significantly more often decided to go on a diet (36.1% OOBMI and 40.3% OOBF%) when compared to other groups ($p < 0.0001$). Subjects with a deficiency (12.3%) and normal body weight (6.8%) in relation to OOBMI adolescents were significantly more likely to smoke cigarettes (16.5%, $p = 0.0202$). In gender groups, boys with OOBMI more frequently consumed alcoholic drinks ($p = 0.0002$). For boys with higher BF%, lower physical activity in leisure time (19.2% vs. 45.5%; $p = 0.1304$) was more often present. Overweight and obese (BF%) girls were less likely to eat outside of the home (4.9% vs. 12.5%; $p = 0.0092$) than undernourished girls. In conclusion, analyzed gender groups in selected lifestyle features were associated with nutritional status.

113. The Relationship between Meal Frequency and Weight Status in Polish Adolescents

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Background and aims: Meal frequency and breakfast consumption have been linked to the risk of obesity in youth. We examined the associations between three different meal patterns on weekdays (five meals including breakfast, ≤four meals including breakfast, and ≤four meals without breakfast) and weight status (expressed as BMI) of Polish adolescents. **Methods:** The sample consisted of 13–19-year-old adolescent boys ($n = 1659$) and girls ($n = 1878$) from Southern Poland. Physical measurements included height, weight, and BMI calculations. Dietary habits and meal frequency were assessed via a self-administrated questionnaire. The data were analyzed using STATISTICA package. **Results:** The questionnaire showed that 44.8%, 43.9%, and 11.2% of participants habitually consumed five meals, ≤four meals including breakfast, and ≤four meals without breakfast, respectively. The adolescents who ate five meals per day were at lower risk of overweight (OR [95% CI] for boys: 0.44; girls: 0.56). There were no significant differences in meal frequency and breakfast consumption among examined underweight teenagers. Overweight adolescents who used to skip breakfast showed a higher intake of snacks, soft drinks, and fast foods (all p -value < 0.001), whereas breakfast consumers ate more fruit, vegetables, and drank milk more frequently. **Conclusions:** The five-meal-a-day pattern was strongly associated with reduced risks of overweight in both genders. Five meals consumption is significantly associated with healthy BMI and healthier dietary habits, but further study, using controlled intervention trials, is required.

114. Validation Study of the Computer-Guided 24 h Recall Used in the Brazilian National Dietary Survey

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The Brazilian nationwide dietary survey conducted in 2017–2018 used a computer-guided 24 h-recall (24hR) called BrasilNutri. The database of food/drink components was based on the 2008–2009 survey, in a national survey with adolescents (ERICA), and also in the Brazilian GloboDiet software (based in the EPIC-soft). A validation study using recovery biomarkers of diet is underway. The study is being conducted on 100 volunteers of the Longitudinal Study of Adult Health (ELSA), and results from the first 18 participants are shown. The conversion of food consumption data into nutrients was performed using the latest version of the Brazilian Food Composition Table (TBCA 6.0). Recovery biomarkers are being obtained, in duplicate, using double-labeled water (DLW) assay and 24-h urine nitrogen, sodium, and potassium analysis. DLW measures will be available only at the end of the study. In this initial sample, 61% are women, the median age is 55, and 72% of the sample belonged to middle- or upper-income classes. The median body mass index was 26.3 kg/m², more than 70% of the participants had excessive body weight, 61% had high waist circumference, and 66.7% had a moderate or high level of physical activity. Daily median dietary intake estimated from the 24hR was 2298 kcal, 71 g of protein, 2402 mg of potassium, and 4314 mg of sodium. Estimates of intake from the biomarkers had the following median values: proteins: 87 g/day, potassium: 2398 mg/day, and sodium: 4825 mg/day. The correlation between both dietary estimates was high for protein ($r = 0.60$; $p = 0.008$) and moderate for potassium ($r = 0.41$; $p = 0.07$), and sodium ($r = 0.23$; $p = 0.35$). Compared with the validation of the previous survey when DLW mean was 2540 kcal, and the mean reported in the 24hR was 1658 kcal, with a frequency of underreporting of 20%, changes in the computer-guided 24 h recall appear to have improved diet measurement.

115. Aging–Induced Salivary Gland Dysfunctions or Oxidative Stress Is Improved by Treatment with *Ixeris Dentata* Extract

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Dry mouth in the aged population occurs due to salivary gland dysfunctions or side effects from certain medications. This current study was proposed to investigate the effect of IXD extract on aging-induced dry mouth. Young (2 months) and aged (20 months) SD rats were used in our study. Water was treated as a vehicle, and IXD extract (25, 50 and 100 mg/kg) was treated via oral gavage in young and aged rats for 8 weeks. Pilocarpine hydrochloride (0.6 mg/kg, ip) was injected for the easy flow of saliva, and saliva was collected for 30 min. We observed that submandibular gland (SMG) weight was significantly increased in aging rats. The salivary flow rate relative to the SMG weight and number of acinar cells were depleted significantly in the aging group; however, IXD treatment augmented the number of acinar cells along with salivary secretion. In addition, salivary alpha-amylase and water channel protein, Aquaporin-5 was upregulated in IXD-treated aging rats. Furthermore, aging-induced ROS generation was alleviated with IXD treatment. Moreover, IXD extract positively regulated the aging-associated ER stress by regulating the formation of high molecular weight complexes PDI, GRP78, CHOP, p-JNK, ATF4, and XBP1 protein expression. These data for the first time suggest that IXD extract has a potential role in secreting saliva and can ameliorate aging-associated oral dryness.

116. Regulation of Xerostomia by Treatment with Ixeris Dentata Extract in Diabetes Mellitus (DM)-Induced Dry Mouth

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Xerostomia, also referred to as dry mouth, is one of the main consequences of diabetes mellitus and is induced by salivary gland dysfunction. This study aimed to investigate the molecular mechanism of diabetes mellitus (DM)-induced dry mouth and an application of natural products from *Ixeris dentata* (IXD), a recently suggested regulator of amylase secretion in salivary cells. Type 1 Diabetes was induced by a single intraperitoneal injection of freshly prepared streptozotocin at a dose of 65 mg/kg (dissolved in 100 mM cold citrate buffer, pH 4.5). During our study, we observed significantly decreased salivary flow in diabetic control rats when compared with their control counterparts. Treatment with IXD extract (100 mg/kg, oral) for 10 days markedly increased salivary output, expression of alpha-amylase, and Aquaporin-5 in diabetic rats. The increased endoplasmic reticulum stress response (GRP78, CHOP, ATF6 α , p-IRE1 α , sXBP1, p-PERK, p-eIF2 α) in the salivary gland of diabetic rats was inhibited by treatment with the IXD extract. Furthermore, IXD extract treatment increased the protein-folding capacity and improved misfolded proteins caused by diabetes. These results suggest the potential value of IXD extract to relieve diabetes-induced dry mouth symptoms.

117. Impact of Supplemented Diets with Fatty Acid Omega 3 on Serum Lipids and Fatty Acid Profiles

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Dietary lipid profile is important to prevent chronic diseases and improve the quality of an individual's life. The aim was to analyze the effect of diets supplemented with different sources of EPA and DHA, on the serum lipid and fatty acid profile of growing rats. Weanling Wistar rats were fed for 10 days with normocaloric diets, according to AIN'93, supplemented with (1) fish oil (F), (2) eggs with high levels of ω 3 fatty acid (E ω 3), and (3) conventional eggs (E). The control group (C) received a normocaloric diet (AIN'93). Serum levels of triglycerides (TG), total cholesterol (TC), and noHDL-cholesterol (noHDL-C) were determined through the enzymatic-colorimetric method. The serum fatty acid profile was determined by gas chromatography. Statistical analysis used ANOVA and Tukey. Results: Serum (mean \pm SD mg/dL) TG: F: 55.57 \pm 15.28, E ω 3: 49.13 \pm 15.63, E: 45.63 \pm 14.39, C: 62.71 \pm 18.79; TC: F: 73.94 \pm 8.73a, E ω 3: 95.27 \pm 7.26b, E: 89.82 \pm 12.08b, C: 65.73 \pm 13.74a; noHDL-C: F: 48.36 \pm 14.17a, E ω 3: 67.76 \pm 9.73b, E: 65.21 \pm 14.95b, C: 44.49 \pm 18.35a. The results of fatty acids profile expressed as area% \pm SD (* p < 0.01) were: EPA: F: 1.77 \pm 0.52b, E ω 3: 0.62 \pm 0.23a, E: 0.33 \pm 0.05a, C: 0.90 \pm 0.38a; DHA: F: 5.75 \pm 0.58b, E ω 3: 5.58 \pm 1.00b, E: 4.43 \pm 0.52b, C: 1.25 \pm 0.24a. The media that did not present the same letter (a,b) were different at p > 0.01. The other fatty acids did not present a significant difference when compared to C. The E ω 3 and E groups showed higher levels of TC and noHDL-C. This would be a consequence of the type of lipid received in the supplementation. The experimental groups showed higher DHA sera levels and only F increased EPA values. Conclusion: These facts suggest sera overtake in EPA and DHA as a result of the supplementation, fish oil supplementation being better than eggs.

118. Development and Characterization of a Nutraceutical of *Curcuma longa* Harvested in Cuba. Evaluation of Its Lipid-Lowering Effect in Patients with Overweight and Obesity

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Introduction: *Curcuma longa*, which belongs to the family Zingiberaceae, is originally found in Cuba in the mountainous regions of Pinar del Rio and Santiago de Cuba. Although it is generally still unknown by our population, its production and use as a species has been extended in our country. Nutraceuticals are nutritional supplements that contain concentrated bioactive natural substances usually present in food, and which could have a favorable effect on health. **Objectives:** This work aimed to obtain a nutraceutical from *Curcuma longa* harvested in Cuba and to evaluate the impact of nutraceuticals on body composition and biochemical parameters in patients of a Metabolic Syndrome clinic belonging to the University Hospital General Calixto Garcia, in Havana. **Results:** The nutraceutical was obtained from *Curcuma longa* cultivated in the Artemisa region, following Good Practices throughout all of the production steps. It was registered at the National Copyright Center (CENDA) with the number 11748-04-2019. The physicochemical and microbiological parameters indicate a nutraceutical with good quality. The capsules contain $5.9 \pm 0.1\%$ of curcuminoids, which justifies the high antioxidant capacity found ($EC_{50} = 128 \text{ ug/mL}$). The study on lipid-lowering effect included 50 patients for 8 months. The results indicated a decrease in the clinical, anthropometric, and body composition indicators and in the biochemical parameters glycemia, cholesterol, and triglycerides, being significant from the third month of the study. **Conclusions:** The nutraceutical from *Curcuma longa* harvested in Cuba contains high levels of curcuminoids and showed a significant lipid-lowering effect in patients with overweight and obesity.

119. Avocado Oil Extract Modulates Auditory Hair Cell Function through the Regulation of Amino Acid Biosynthesis Genes

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Sensorineural hearing loss (SNHL) is one of the most common causes of disability, affecting over 466 million people worldwide. However, prevention or therapy of SNHL has not been widely studied. Avocado oil has shown many health benefits, but it has not yet been studied with regard to SNHL. Therefore, we aimed to investigate the efficacy of avocado oil on SNHL in vitro and in vivo and elucidate its mode of action. For the present study, we used enhanced functional avocado oil extract (DKB122). DKB122 led to the recovery of otic hair cells in zebrafish after neomycin-induced otic cell damage. Further, DKB122 improved auditory sensory transmission function in a mouse model of noise-induced hearing loss and protected sensory hair cells in the cochlea. In addition, RNA sequencing was performed to elucidate the mechanism involved. KEGG pathway enrichment analysis of differentially expressed genes showed that DKB122 protected House Ear Institute-Organ of Corti 1 (HEI-OC1) cells against neomycin-related alterations in gene expression due to oxidative stress, cytokine production, and protein synthesis.

