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Conference Report

Abstracts of the 4th International Electronic Conference on Nutrients (IECN 2024), 16–18 October 2024

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Abstract: The 4th International Electronic Conference on Nutrients—Plant-Based Nutrition Focusing on Innovation, Health, and Sustainable Food Systems (IECN 2024) took place online from 16 to 18 October 2024, which aimed to serve as a multidisciplinary platform for the exploration of innovative research and advancements in nutrient science with a focus on innovations for health and sustainability. Over 150 scholars and experts attended this virtual online conference. Five keynote speakers and seven invited speakers shared their knowledge and discoveries. The conference received 220 abstracts submissions, of which 147 were accepted. This conference report is an abstract collection from six different sessions of IECN 2024.

Keywords: nutrient science; sustainable food systems; plant-based diet; innovation in nutrition; clinical nutrition; sports nutrition; environmental sustainability

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1. Introduction

The 4th International Electronic Conference on Nutrients (IECN 2024), 16–18 October 2024, was an exclusive meeting dedicated to the latest developments in scientific research in the field of nutrient research with a focus on innovations for health and sustainability. This conference aimed to serve as a multidisciplinary platform for the exploration of innovative research and advancements in nutrient science. Emphasizing both macro- and micronutrients, the conference delved into novel methodologies for nutrient extraction, bioavailability, and functional food development. Analytical techniques such as metabolomics, proteomics, and nutrient profiling were discussed in the context of their application to food safety and quality. As the global search for healthier and more sustainable diets intensifies, the role of nutrients and lifestyle modification are at the forefront. For a healthier and more sustainable diet, it is clear that most people will need to incorporate more plant-based foods into their diet. Moreover, as we strive to feed a growing global population, the role of plant-based foods becomes increasingly critical. The aim was to explore the effectiveness of using plant-based nutrition as a primary approach in preventing, suspending, and even reversing chronic diseases. Furthermore, the conference aimed to foster dialogue on the critical intersections between nutrient science, public health, and sustainable food systems. Our collective goal is to challenge existing scientific paradigms, broaden the scope of research, and contribute to an integrated approach where innovation, health, and sustainability coexist harmoniously.

The topics of this conference are outlined below:

S1. Plant-Based Diets: Health and Well-being;
S2. Innovation in Dietary Choices;
S3. Diet and Chronic Disease Management;
S4. Global Nutrition Trends: Shaping Health and Athletic Performance;
S5. Behavioral Approaches to Healthier Eating;
S6. Nutrition Across the Lifespan.

2. Session 1: Plant-Based Diets: Health and Well-Being

2.1. Evaluating the Viability of Plant-Based Milk: A Sustainable Alternative to Dairy

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Introduction

The growing interest in plant-based diets has led to a shift in dietary habits with a focus on replacing traditional animal-derived milk with plant-based alternatives like plant-based milk analogues (PBMAs). These alternatives offer nutritional benefits like lower saturated fats and calories and are often fortified to meet or exceed traditional dairy food nutritional profiles.

Methods

This study aimed to develop and evaluate the potential of PBMAs as sustainable and nutritious dairy milk substitutes. High-quality raw materials were procured, and preliminary processing techniques were optimized. Physical, chemical, and organoleptic evaluations were conducted with the most sensorily acceptable sample selected for innovative food products.

Results

The pH of plant-based milk analogues (PBMAs) ranged from 6.0 to 6.8, making them slightly acidic to neutral. Oat milk excelled in carbohydrates (82.24 g/100 g) and moisture (87.5 g/100 g), while little millet milk was superior in protein (9.17 g/100 g) and iron (9.2 mg/100 g). Cow's milk contained the highest fat (3.2 g/100 g) and calcium (110 mg/100 g). Corn milk offered a balance of carbohydrates (70.10 g/100 g) and protein (8.32 g/100 g). Oat milk also demonstrated higher viscosity (48.6 cP) and superior sensory acceptance. Regarding antioxidants, oat milk contained the most polyphenols (10.6 mg GAE/100 g), which was followed by corn (7.05 mg GAE/100 g) and little millet (6.04 mg GAE/100 g) milk.

Conclusions

This study suggests that plant-based milk analogues (PBMAs) like oats milk, corn milk, and little millet milk can be a sustainable alternative to traditional cow's milk. These alternatives offer high nutritional content, high protein, high iron levels, and high total polyphenol content. They are also suitable for various culinary applications, making them suitable for individuals with dietary restrictions or preferences. Further research is needed to improve the quality, functionality, and acceptance of PBMAs, driving innovation and sustainability in the global food system.

2.2. Antibacterial Activities in Various Tissues of Artemisia

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Due to the side effects and resistance of pathogenic microorganisms to antibiotics and most drugs on the market, a great deal of attention has been paid to extracts and biologically active compounds isolated from plant species used in herbal medicine. For this purpose, we investigated two Artemisia species with different tissues and from different years of vegetation. The growing year of the plants positively influences the activity of S. aureus in the sense that MIC and MBC values for extracts from *Artemisia absinthium* L. growing year I are higher than those from growing year II. As a physiological part of the plant, the leaf, which is richer in compounds, has higher antimicrobial activity compared to the stems,

and the second year of vegetation also positively influences the bacterial inhibition activity. *A. absinthium* leaf extract from the second year of vegetation showed higher antioxidant capacity as a Trolox antioxidant capacity equivalent, and 2,2-diphenyl-1-picrylhydrazyl free radical scavenging activity, in correlation with flavonoid and phenolic acid contents. So, based on the most recent literature, we can hypothesize the possible application of new therapeutic protocols for resistant infectious diseases based on the use of natural extracts of Artemisia. Artemisia species with high biological values are a potential source of health and well-being.

2.3. Are Common Edible Mushrooms an Answer to Healthier Diets for Global Nutrition Given Their Sustainability, Nutrient Density, and Health-Promoting Bioactives?

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Introduction

Mushrooms, a fairly uncommon food source in the US belonging to the Fungi kingdom, share characteristics with both plants and animals, making them a unique source of critical nutrients and quality protein. They also contain significant amounts of bioactive compounds and, when exposed to UV light, vitamin D2. Adaptable to many climate conditions and grown globally year-round indoors at low costs, mushrooms are a useful crop in low-income countries. Herein, we looked for evidence that mushrooms may be a promising food source worldwide for future healthier diets.

Methodology

A non-exhaustive literature search of PubMed was performed to find recent epidemiological and dietary intervention studies examining health outcomes related to mushroom bioactive components: ergothioneine, beta-glucans, glutathione, and vitamin D2.

Results

Several epidemiology studies, but not all, showed positive health outcomes associated with mushroom consumption. A Korean study found that an individual's level of mushroom consumption was correlated with their likelihood of developing type 2 diabetes later in life. Other US and Chinese studies showed a decrease in all-cause mortality linked to mushroom intake. Greater mushroom consumption was associated with lower serum CRP and triglycerides, attributed to beta-glucans, while some dietary interventions showed benefits from reduced oxidative stress and inflammation, but others showed no cardiovascular benefits. Correlations between mushroom consumption and lower rates of lung and prostate cancer and cognitive decline were also reported.

Conclusions

Recent studies have shown correlations between mushroom intake and positive health outcomes, highlighting the potential of mushrooms as a healthy food source; however, some studies do not support definitive conclusions about the link between mushroom intake and reduced disease risk, making this a subject requiring further study. Moreover, mushrooms have a clear potential to improve nutritional intake even in times of climate crisis disrupting traditional agriculture, since they can be sustainably grown without irrigation and valuable land use.

2.4. Cocoa Shell Supplementation Modulates Plasma Metabolome in Female Rats: Insights from Untargeted Metabolomics

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The utilization of food industry by-products for health-promoting purposes is gaining attention with cocoa shell extract (CSE) emerging as a promising candidate. Rich in bioactive compounds such as methylxanthines, (poly)phenols, and dietary fiber, the cocoa shell demonstrates antioxidant, anti-inflammatory, lipid-lowering, and vasoactive properties. Hence, our objective was to investigate the impact of CSE intake on the rat plasma metabolome. By employing untargeted metabolomics and a chemometric analysis, we aimed to identify the key metabolites and enriched metabolic pathways influenced by the cocoa shell, thereby elucidating the plasmatic changes induced by this dietary intervention. Female rats were supplemented with a daily dose of 250 mg/kg CSE over seven days. Plasma samples were collected at baseline, day 4, and day 7, and subjected to untargeted metabolomic profiling using LC-ESI-QTOF. The analysis identified 244 metabolites, revealing significant reconfigurations by day 7. Enhanced pathways included caffeine, glycerophospholipid, nicotinate, and nicotinamide metabolism, indicating increased lipid metabolism and energy homeostasis. Conversely, reductions in tryptophan, glutathione, arginine, and proline pathways suggested alterations in amino acid metabolism and antioxidant defenses. A network analysis further highlighted significant changes in the cholinergic synapse, retrograde endocannabinoid, and glutamatergic synapse pathways, which are crucial for cellular communication and neurotransmission. These findings underscore the rapid modulation of the metabolome by CSE intake, demonstrating the bioavailability of key components like methylxanthines. This study's results suggest that CSE, a sustainable cocoa by-product, could serve as a functional food ingredient, promoting metabolic health through its effects on lipid metabolism, energy homeostasis, and neurotransmission pathways. This research not only advances our understanding of the biological activity of CSE but also supports its potential application in dietary interventions aimed at enhancing metabolic and cardiovascular health, thus contributing to the sustainable use of food by-products and their potential in health promotion.

2.5. Microplastics in Plant-Based Diets: Potential Risks and Health Consequences

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Introduction: The widespread contamination of the environment by microplastics has become a growing concern. This work examines the evidence of edible plants and plant-based food contamination and the pathways through which microplastics can enter plants, focusing on fruits, vegetables, grains, and other plant-derived products via contaminated water, soil, and atmospheric deposition.

Methods: A comprehensive literature review was conducted using search criteria to identify relevant studies published up to 2024. Databases such as PubMed and Web of Science were searched using keywords including "microplastic", "edible plants", "plant-based food", "human health", and "agricultural uptake". A total of 20 articles were included for the analysis, providing data on microplastic uptake by edible plants, plant-based food, and potential human health implications.

Results: Significant quantities of microplastics were detected in fruits, vegetables, and grains consumed by humans. The hypothesis that microplastics can harm the nu-

tritional value of plant-based foods and potentially harm human health was supported by evidence. Additionally, organic pollutants and heavy metals accumulate in plant tissues, potentially entering through microplastics. Findings demonstrated that microplastics infiltrated agricultural systems through contaminated water, polluted air, and absorption from contaminated soils. Proposed biological impacts included inflammation, cytotoxicity, and disruptions to gut microbiota. Microplastics were also proposed to interfere with nutrient absorption and bioavailability, affecting the nutritional quality of edible plants and plant-based foods.

Conclusions: Current evidence shows that edible plants and plant-based foods are contaminated by microplastics and that can pose a human health risk. This work highlights the urgent need for comprehensive risk assessments and regulatory frameworks to address microplastic contamination in edible plants and plant-based foods. Future research should focus on developing mitigation strategies and exploring the long-term health impacts of microplastic ingestion. Heightened awareness and coordinated efforts among scientists, policymakers, and the agricultural sector are required.

2.6. The Impact of Berry Fruits from the Vaccinium Genus on Drug-Metabolizing Enzymes: A Systematic Review

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Plants of the *Vaccinium* genus are low-branched, deciduous shrubs that belong to the *Ericaceae* family. They produce berries rich in various phenolic compounds, including quercetin, myricetin, isorhamnetin, tannins, ellagitannins, phenolic acids, and anthocyanins. The most abundant bioactive compounds in these berries are anthocyanins, which give the fruits their distinctive dark blue color. These metabolites comprise anthocyanin aglycones, sugar moieties, and acyl groups.

This study aimed to systematically review clinical research on the effects of berry fruits on drug-metabolizing enzyme activity.

This review followed the PRISMA guidelines. We conducted electronic searches in academic databases such as Cochrane, Ebsco, PubMed, Embase, Scopus, and Web of Science. The primary inclusion criteria for all databases included the following: (1) keywords (Vaccinium, blueberry, bilberry, cranberry) and ("drug interactions" or "medicines interactions"), (2) publication years (1993–2022), (3) language (English), and (4) publication type (article). Three reviewers independently conducted the search and selection process. Initial searches yielded 249 results. Two independent researchers then reviewed titles, abstracts, and full papers, excluding those not meeting the inclusion criteria through discussion. A total of 31 original studies were selected for review.

The positive health benefits of berry fruits have increased the production and consumption of dietary supplements rich in blueberry extract. However, high doses of berry extracts from the Vaccinium genus may cause adverse effects, including potential interactions with other drugs. Blueberry extracts can influence drug behavior and efficacy by altering the activity of drug-metabolizing enzymes, which convert lipophilic drugs and other xenobiotic compounds into polar products for more straightforward elimination from the body. Such interactions between berry fruit compounds and medications can pose risks to patients.

2.7. A Comparison of the Pharmacognostic, Nutritional, and Phytochemical Parameters of Moringa Concanensis from Three Different Geographical Sources in India

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The current atmospheric changes affect biodiversity and the geographical distribution of natural species, including plants and animals. Plant species can convert, adapt to, or associate with the climatic conditions to adjust to a particular environment, as seen, e.g., at higher altitudes or in Eastern and Western regions. These changes are observed worldwide; therefore, provincial and territorial research is necessary to establish a legitimate management approach that precisely minimizes negative aesthetic, health-related, and financial consequences. A traditional medicinal plant found in tropical deciduous forests in India is *Moringa concanensis Nimmo* (Moringaceae). In the present research study, different specimens of *Moringa concanensis* from three different geographical sources in India were studied for their pharmacognostic, nutritional, and phytochemical aspects. The pharmacognostic and preliminary phytochemical analysis of leaves of *Moringa concanensis,* including their macroscopic, microscopic, and physicochemical parameters, was conducted as per WHO guidelines. *Moringa concanensis* leaves were successively extracted using five different solvents (petroleum ether, chloroform, ethyl acetate, methanol, and water) with varying polarity. Each extract was then subjected to a phytochemical screening. The analysis of phytochemicals revealed the presence of cardiac glycosides, terpenoids, steroids, flavonoids, alkaloids, proteins, carbohydrates, tannins, and phenolics. The changes observed according to regional ecological conditions were recorded. Nutritionally and phytochemically, all three species show similarities with the major identified constituents.

2.8. Advancing Plant-Based Health: Synthesis and Characterization of Tomato Waste-Derived Nanoparticles with Antioxidative and Antibacterial Properties

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The fields of information technology, energy, environmental science, medicine, homeland security, food safety, and transportation are impacted by nanotechnology, as they are based on developments in chemistry, physics, materials science, and biotechnology. Nanotechnology concerns materials with particles of a certain geometry ranging in size from 1 to 100 nm, thus exhibiting novel physical, chemical, and biological properties. Particles on these scales show markedly different properties to their bulk material counterparts. Green synthesis has continued to draw a significant interest in the context of materials science owing to its properties as an environmentally sustainable and eco-friendly approach in the synthesis of a variety of nanomaterials, including metal/metal oxide nanoparticles, hybrid materials, and bioinspired materials. This present study was undertaken to investigate the synthesis, characterization, and antioxidative and antibacterial activities of MnO, ZnO, and FeO NPs from tomato processing waste. Visual inspection, UV–visible spectroscopy, Fourier-transform infrared spectroscopy (FTIR), and X-ray diffraction (XRD) were utilized for the characterization of the synthesized nanoparticles. Quantitative analysis focused on the presence of phenolic and flavonoid components in the nanoparticles. The total phenolic content was determined to be 22.098 ± 0.00153 mg GAE/g for MnO, 21.957 ± 0.0011 mg GAE/g for ZnO, and 21.100 ± 0.0005 mg GAE/g for FeO. The in vitro radical scavenging abilities of the nanoparticles were assessed using the DPPH assay, revealing IC50 values of 47% for MnO, 34% for ZnO, and 40% for FeO. Additionally, the antibacterial activities of the nanoparticles were tested against Escherichia coli (Gram-negative bacteria), Staphylococcus aureus (Gram-positive bacteria), and Escherichia faecalis (Gram-positive bacteria). The results underscore the potential of tomato waste-derived nanoparticles in antioxidant and antibacterial applications, highlighting their utility in the biotechnological and pharmaceutical industries.

2.9. Assessment of Superoxide Dismutase Enzyme Activity in Various Plant Residues

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Introduction: Superoxide dismutase (SOD) holds significant importance in the pharmaceutical, nutraceutical, and cosmeceutical industries due to its role in neutralizing toxic superoxide radicals. In this study, we investigated plant residues as a source of SOD enzyme.

Methods: Plant residues from five different plants were analyzed for their SOD enzyme content. Peels from watermelon (*Citrullus vulgaris* Schrad.), bitter orange (*Citrus aurantium* L.), three varieties of melon (*Cucumis melo* L.)—Hafidh Nafsah, Ananas, and Alasfer Alshtwi—banana (*Musa paradisiaca* L.), and potato (*Solanum tuberosum* L.) were evaluated. The extraction of each plant peel was performed using potassium phosphate buffer (50 mM KH_2PO_4, pH 7.8). Each sample was tested in triplicate for SOD activity and specific activity. Polyacrylamide gel electrophoresis (PAGE) was used to detect different SOD isoenzymes in the plant peels with and without the selective inhibitors potassium cyanide (KCN) and hydrogen peroxide (H_2O_2).

Results: Peels from melon, watermelon, and bitter orange exhibited higher SOD activity compared to peels from potato and banana. SOD activity remained stable for six months when stored in the freezer. Among the various local melon varieties studied, the Ananas variety exhibited the highest SOD activity and specific enzyme activity. Out of the different buffers tested for extracting the enzyme from melon peel, potassium phosphate buffer (50 mM KH_2PO_4, pH 7.8) with EDTA (0.1 mM) demonstrated the highest specific activity. PAGE results indicated that bitter orange peel contains five isoenzymes of MnSOD and one isoenzyme of CuZnSOD. Melon peel contains two isoenzymes of both MnSOD and FeSOD and one isoenzyme of CuZnSOD. Watermelon peel contains two isoenzymes of CuZnSOD and one isoenzyme each of FeSOD and MnSOD.

Conclusions: The Ananas melon variety demonstrated the highest SOD activity and specific activity among various local melon varieties. This makes its peels an exceptionally efficient source for extracting an enzyme with numerous pharmaceutical and cosmeceutical applications.

2.10. Biomonitoring the Heavy Rare Earth of Ytterbium in Wild Soil Mushrooms: Potential Risks

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Rare earth elements are widely distributed in foods. Although the biological role of ytterbium (Yb) is unknown, it is believed to stimulate metabolism. The presence/distribution in topsoils from Leicestershire (UK) are shown to represent some risks for the population. In detail, 106 wild mushrooms were collected from Leicester city and Bradgate Park. Yb was monitored by ICP-MS in cleaned/dried/homogenized mushrooms [LoD = 0.57 ng/g dry weight (dw)]. Mushrooms collected in Bradgate showed higher levels of Yb (median and ranges, in μg/g dw): 1.76 (0.29–56.33) vs. 1.47 (0.45–300.95). These results could

be explained by the levels in topsoils, which were slightly higher in those collected in the rural areas [0.90 (0.49–1.14) vs. 0.83 (0.62–1.21); all in mg/kg)]. Similarly, levels of Yb were higher than those monitored in edible mushrooms collected in Poland's forests (0.01–0.21 mg/kg dw), which were collected in topsoils with a lower contamination of this element (0.02–0.42 mg/kg). Our results might suggest similar sources of this element throughout Leicestershire, although no correlation was found between topsoils and mushrooms (p-value = 0.58). The content of clay might explain the distribution of Yb in the mushrooms collected in the urban areas. Thus, mushrooms with a higher content of Yb were found in those picked up in the NE area versus the NW of the city (4.38 vs. 0.98 μg/g dw), as clay content was significantly higher in topsoils sampled in the NE (27 vs. 18.5%). However, we did not see any significant correlations between the Yb levels in mushrooms and topsoils for any of the soil properties/textures determined. Yb also varied between major mushroom species collected (median and range, in μg/g): *Agaricus bitorquis* [edible; 0.92 (0.90–7.69), *Panaeolus foenisecii* [poisonous; 4.24 (1.13–176.82)] and *Mycena citrinomarginata* [unclassified; 6.61 (1.58–76.74)]. Although no limits have been established for Yb in edible mushrooms as yet, its presence would represent a minimal risk for Leicester's population.

2.11. Chromatographic Analysis of Bioactive Metabolites from a Traditional Food Combination of (Semi) Arid Regions—Panchkuta: Insights for Sustainable Functional Foods Development

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Introduction—Conventional agriculture may not meet the needs of growing human populations and sustainable development in the future. These issues necessitate a shift toward traditional foods and underutilized desert plants, offering promising sustainable agricultural and food security alternatives. The ethnomedicinal and nutraceutical properties of these plants further underscore their potential. '*Panchkuta*', a blend of five plants, namely, *Prosopis cineraria*, *Cordia dichotoma*, *Capparis decidua*, *Acacia senegal*, and *Mangifera indica*, is a traditional food combination of (semi) arid regions.

Methods—In this study, *P. cineraria*, *A. senegal*, *C. decidua*, *C. dichotoma*, and *M. indica* were mixed in a 14:13:8:4:1 ratio, respectively. The powdered mixture was extracted with hexane and methanol. Further, we tested the antioxidant activity of the hexane extract using a (2,2-diphenyl-1-picrylhydrazyl) DPPH assay. The bioactive metabolites were identified through analytical techniques, including TLC and GC-MS analysis.

Results—The hexane extract showed the presence of different classes of phytochemicals, such as hydrocarbons (heneicosane), fatty acids (palmitic acid, oleic acid), phytosterols (campesterol, stigmasterol), monoterpenes (p-cymene), triterpenes (squalene), and vitamins (gamma-tocopherol). The TLC analysis of methanolic extract showed the presence of various classes of phenolics (flavonols, isoflavones, and flavones) when sprayed with Natural Product Reagent (NPR) and observed under 254 and 365 nm. The antioxidant capacity of these plants, quantified through the DPPH assay, highlights their ability to scavenge free radicals, thus playing a pivotal role in preventing chronic diseases.

Conclusions—The antioxidant activity of the *Panchkuta* hexane extract could be attributed to the presence of phytoconstituents characterized through GC-MS analysis. Integrating ethnic foods into modern diets aligns with the Sustainable Development Goals (SDG—aims to achieve food security, end hunger, and promote sustainable agriculture; SDG 13—aims to take urgent actions to combat the impacts of climate change). Tapping these underexplored plants can help design and develop healthy functional foods and nutraceutical products.

2.12. Cognitive-Function-Improving Effects of Tanacetum vulgare Hydroalcoholic Extract in Rats with Scopolamine-Induced Amnesia

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In recent decades, phytochemicals have been the object of extensive research for their ability to improve or prevent cognitive decline. *Tanacetum vulgare* L. (common tansy) is a rich source of various secondary metabolites (essential oil, sesquiterpenoids, and phenolic compounds) with anti-inflammatory, antioxidant, and antimicrobial activity. However, research data about its cognitive effects are scarce. The present study investigated the effect of two doses of *T. vulgare* hydroalcoholic extract (TVE) on learning and memory in an experimental model of scopolamine-induced amnesia in rats.

The experiment was conducted using a Shuttle box apparatus for active and passive avoidance. Fifty male Wistar rats were divided randomly into five groups (n = 10) as follows: placebo (C-veh), scopolamine (C-Scop), glycerin + scopolamine (Gly-Scop), scopolamine + 200 mg/kg TVE (*T. vulgare*-Scop 200), and scopolamine + 1000 mg/kg TVE (*T. vulgare*-Scop 1000). The measured behavioral parameters were the number of avoidances, the number of escapes, and the number of inter-trial crossings. Statistical evaluation was carried out using one-way ANOVA and Tukey's post hoc test at a level of significance of p 0.05.

We found that both groups with scopolamine-induced amnesia (C-Scop and Gly-Scop) had impaired learning and memory compared to the C-veh animals (p 0.05). Both doses of TVE increased the number of avoidances compared to the C-Scop and Gly-Scop groups during the learning session on days 4 and 5 (p 0.05) as well as on the re-test on day 12 (p 0.001). An increased number of escapes was observed on day 5 in animals treated with 200 mg/kg TVE, and on the re-test, in those treated with 1000 mg/kg TVE, compared to the C-Scop and Gly-Scop groups (p 0.05). *T. vulgare* 200 mg/kg increased the number of inter-trial crossings on the re-test compared to the C-Scop rats (p 0.01).

These results reveal the beneficial effect of TVE on cognitive function in rats with scopolamine-impaired memory. Further research is needed to explore the plant's potential as a nutrient supplement with cognitive-function-enhancing properties.

2.13. Comparative Effect of Chitosan, Clove Oil, and Their Combination on the Shelf Life of Tomato (Solanum lycopersicum) and Bell Pepper (Capsicum annuum)

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Introduction: Tomatoes and bell peppers, essential vegetables rich in nutrients and antioxidants, are also highly perishable. This study, therefore, examined the potential of chitosan solution (CS), clove oil emulsion (COE), and chitosan nanoparticle-loaded clove oil (CNLCO) as edible coatings to extend the shelf life of these vegetables.

Methods: Coated samples were stored at room temperature (28 $\pm$ 7 °C) for a period of 30 days. Changes in sample ripening were evaluated based on color and weight every 3 days, and chemical analyses were conducted every 5 days.

Results: Only CNLCO-coated bell peppers lasted 15 days before turning red, while all categories of tomatoes turned red by day 12. There was a substantial weight loss of up to 71.9% in the first 2 weeks of storage for the bell pepper groups, while the tomato groups experienced an average weekly weight loss of 5.2%. The pH, total soluble solid

(TSS), total sugar (TS), reducing sugar (RS) and non-reducing sugar (NRS) values of the treated samples' ranges were as follows: pH (4.3–4.9), TSS (2.9–3.8 Brix), TS (1.5–2.1%), RS (0.9–1.0%), and NRS (0.5–0.9%) for tomatoes and pH (4.9–6.0), TSS (3.1–5.5 Brix), TS (2.1–5.2%), RS (0.2–0.4%), and NRS (0.5–1.0%) for bell peppers. The titratable acidity (TTA) values for the tomato groups (0.5–0.9%) were normal, while both bell pepper groups with chitosan in their coating showed deteriorating values (CS: 1.2%; CNLCO: 0.6%) on day 25.

Conclusions: The pH, TSS, TS, RS, and NRS values of the treated samples did not reach levels indicative of spoilage during storage, unlike the untreated samples. Applying the studied edible coatings, alone or in combination, is important in reducing postharvest losses of tomatoes and bell peppers and will offer new possibilities for the field.

2.14. Comparison the Effects of Different Culturing Methods on the Composition of Hericium erinaceus, a Valuable Mushroom for Health and Well-Being

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Hericium, a famous edible mushroom used for medicine and food, has fleshy white spines hanging down from their thick unbranched cluster and always grows on decaying or dead wood. This study was performed in Uttarakhand, India, to produce these mushrooms artificially and to optimize their mycelial growth on agar culture media. The temperatures, pH levels, carbon sources, nitrogen sources, and the ratio of media constituents varied under different conditions. For this study, a *H. erinaceus* (DMR-779) culture strain procured from the Directorate of Mushroom Research, Solan HP, India, and tissue culture techniques from *H. erinaceus* fruiting body PDA plates were used to compare the difference at varying temperatures, from 18 to 25 °C, and a pH of 4–4.5. After the successful running of mycelia on the plates, they were transferred to bags containing cereals such as wheat and rye at different concentrations, 2.5% calcium carbonate, and 0.5% gypsum, the latter used to manipulate the mycelia running rate in the bags. It was observed that bags made with pure wheat had a higher mycelium running rate than others. Healthy mycelia bags (mother bags) were further used to produce fruiting bags (commercial bags) containing different ratios of sawdust (eucalyptus and poppy) and wheat bran (80:20). The data collected from this experiment will be useful in cultivating *Hericium* mushrooms, which in turn can further be used to enhance the health benefits of a variety of food products.

2.15. Content of Manganese in the Wild Edible Mushroom Species of Agaricus bitorquis in the English City of Leicester

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Background and Aim: The aim was to assess the risks to manganese (Mn) present in wild edible mushrooms *Agaricus bitorquis* collected in Leicester city, England.

Methods: Twenty-two mushrooms were collected from an open green area close to St Augustine Road, which is a high-traffic area within Leicester. Species identification was confirmed by DNA barcoding using internal transcribed spacer 1/4 primers after extracting DNA from 100 mg of frozen homogenized ground mushroom material using a DNeasy Plant Mini Kit®. Mn was monitored by ICP-MS in cleaned/dried/homogenized

mushrooms [LoD = 0.529 mg/kg dry weight (dw)] and in 36 topsoil composite samples collected across the city.

Results: Mn was detected in all the samples; the median and range in mg/kg dw were 10.541 (6.877–14.158). The distribution of Mn in mushroom tissues did not show statistical differences (p-value = 0.1), although slightly higher levels were found in caps versus stipes (data provided as median and ranges in mg/kg dw: 10.541 (6.877–14.158) vs. 9.617 (3.665–17.154). These results agree with the literature reporting a higher accumulation of metals in the caps of wild edible mushrooms. Thus, a translocation factor of 1.096 was determined for Mn in the monitored mushrooms. Although the content of Mn in mushrooms would be minimally affected by its presence in topsoils (the bioconcentration factor was lower than the unit), the levels monitored in composite topsoil samples [411.012 (253.066–730.977 mg/kg)] were studied. Non-carcinogenic risks quantified for the levels of Mn in topsoils were lower than the threshold, suggesting minimal risks to the population.

Conclusions: The levels of Mn were much higher than those detected in *Agaricus bisporus* species collected in a natural forest in eastern Poland (5.91 mg/kg dw), suggesting a potential contamination by Mn in the inner city of Leicester, which would be in agreement with other toxic metals monitored in these samples, such as cadmium and lead.

2.16. Development of Curry-Flavored, Pea- and Faba Bean-Protein-Enriched Snacks

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Introduction: A growing demand for a wide variety of plant-based protein-enriched foods is currently observed. However, obtaining products that can attract consumers while preserving their nutritional and sensory value can be challenging.

Objective: The aim of this study was to develop plant-based protein-enriched snacks with adequate sensory characteristics that can be added to vegetable dishes in order to increase their protein supply.

Materials and Methods: Two types of snacks with pea protein and faba bean protein concentrates, virgin olive oil, and curry were elaborated. Firstly, emulsions were prepared by gentle stirring of the protein solution (to provide approximately 15% protein) with the oil (10%). After emulsion, curry (0.8%) was added, and the mixture was heat-treated in a steam sterilizer.

Results: The protein content of the snacks was 16.25% and 16.05% for the pea and faba bean products, respectively, allowing them to qualify as "high protein" (EU Regulation 1924/2006).

Sensory analysis results showed that 71% (for the pea protein snack) and 67% (for the faba bean protein snack) of consumers considered the odor of the products acceptable. In terms of taste, differences between the two snacks were found. Whereas 86% of the panelists noticed the curry taste in the pea protein snacks, only 38% reported this flavor in the faba protein snacks, which were described as odd by 71% of panelists.

Regarding instrumental sensory tests, the surface color was darker than the core color in both snacks. Texture analysis showed that the pea protein snacks were significantly harder (hardness = 25.78 N) than the faba bean protein snacks (hardness = 9.17 N), which was probably due to differences in the composition of both concentrates.

Conclusions: Two types of plant-based protein-enriched snacks were developed. Those based on pea protein seemed to be more adequate from a sensory point of view.

2.17. Development of Energy Bars from Traditional Fruits and Vegetables to Increase Antioxidant Levels

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Introduction

Antioxidants have gained significant attention in nutrition due to their potential in reducing the risk of various diseases, including cancer. These antioxidants can scavenge free radicals and mitigate the process of aging.

Objective

The primary aim of this study was to develop energy bars from traditional and underutilized fruits and vegetables found in Pakistan, namely, Kachnar (*Bauhinia variegate*), Moringa (*Moringa oleifera*), Loquat (*Eriobotrya japonica*), and Ber (*Jujuebe ziziphus*).

Methodology

A total of 12 treatments were formulated by combining different proportions of the above fruits and vegetables to create energy bars. To enhance the nutritional value and healthfulness of the bars, honey was used as a sweetening agent. Proximate analysis and antioxidant level assessments were conducted on the developed products. Additionally, a sensory evaluation was carried out by a panel of experts.

Results

The combination of Ber, Loquat, and Moringa exhibited the highest antioxidant levels, ranging from 150 mg to 250 mg per energy bar. The combination of Ber and Loquat showed the highest antioxidant levels, ranging from 80 mg to 100 mg. Kachnar, on the other hand, demonstrated the least variation in its antioxidant levels. The remaining treatments exhibited antioxidant levels ranging from 50 mg to 80 mg with those containing Kachnar showing the least variation. During the sensory evaluation, the experts categorized Ber, Moringa, and Loquat among the best for taste.

Conclusions

The antioxidant levels of Kachnar are not well documented in the literature, and further research is necessary to understand its exact mechanism and the beneficial effects of combining these fruits and vegetables. Moreover, an efficacy study on humans could also be conducted to assess its effectiveness. This study provides valuable insights into the potential of utilizing underutilized local produce to develop nutrient-dense and antioxidant-rich energy bars.

2.18. Development of Functional Fruit Jam Using Black Persimmon and Black Currant and Unveiling Its Nutritional Value, Phytochemical Profile, and Consumer Appeal

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Fruits play a pivotal role in maintaining a healthy lifestyle by offering essential nutrients and aiding in illness prevention. Several fruits are reutilized in the production of value-added products like jams to extend their shelf life and for off-season consumption. In this regard, we sought to formulate a novel and nutritionally dense mixed fruit jam by combining black persimmon (*Diospyros lotus* L.) and black currants (*Ribes nigrum* L.) due to their high phytochemical profiles and potential as antioxidant and anti-inflammatory agents. Jam was developed by using a conventional thermal process in six treatments with different ratios (%) of black persimmon–black currant, T0 (0:100), T1 (20:80), T2 (40:60), T3 (60:40), T4 (80:20), and T5 (100:0), respectively, and evaluated comprehensively for proximate, mineral, and phytochemical analyses, and sensory evaluation (color, aroma, taste, flavor, appearance, texture, and overall acceptability). The proximate composition

of jam formulations showed that carbohydrates were the most abundant component, ranging from 56.2% to 73.33%, with protein content between 2.21 and 11.24%, while the mineral analysis indicated a significant presence of potassium (20.21–608.66 mg/100 g) along with other essential minerals like calcium, magnesium, zinc, and iron, demonstrating jam's conservation ability to preserve nutrients. Through comprehensive in vitro analyses, we found that jam formulation T3 exhibited excellent physicochemical properties with higher total soluble solids (74°brix), titratable acidity (1.63%), optimal pH (3.29), and impressive phytochemical profile, having significantly high levels of phenols (8.9 mg/g), flavonoids (1.59 mg/g), tannins (35.44%), TPC (3.99 g GAE/100 g), TFC (0.98 g CE/100 g), and ascorbic acid (190.64 mg/g) as compared to controls (T0 and T5). Interestingly, T3 also possessed good antioxidant potential, displaying DPPH radical scavenging activity (37.99%) and FRAP (388.98 μmol of Fe^{2+}/g). Sensory assessment showed that T3 received the highest acceptability score. In conclusion, our study highlights that black persimmon–black currant jam enriched with phenols and antioxidants could hold significant market potential, offering consumers a delicious and potentially health-promoting product.

2.19. Edible Oils in the Diet of High School Students: How Judo Training and Physical Activity Shape Healthy Habits

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The daily diet of high school adolescents depends on their level of physical activity. Students who engage in sports, such as judo, require more energy, protein, and micronutrients to support muscle recovery and overall health. Adjusting the diet to the intensity of exercise is crucial for ensuring the appropriate amount of calories, hydration, and nutrient balance. Edible oils are crucial in the diet of high school students; the fatty acids they contain aid in muscle recovery after judo training and support heart and brain health. They also facilitate the absorption of fat-soluble vitamins, which is essential for both active athletes and physically inactive students. The regular consumption of edible oils contributes to maintaining a balanced diet, healthy cholesterol levels, and counteracting inflammatory conditions. The aim of this study was to analyze the role of edible oils in the diet of high school students, both those who regularly practice judo and those who do not engage in additional physical activity. It was hypothesized that judo practitioners would have different nutritional needs and benefits compared to non-athletes. The study employed a questionnaire to assess dietary views and habits, KomPAN data processing procedures, and the International Physical Activity Questionnaire (IPAQ) to evaluate physical activity. The results indicate a relationship between a healthy diet and judo training with 68% of judo students having a higher Healthy Diet Index (HDI) and 66% maintaining a healthier BMI compared to their less-active peers. Additionally, a correlation was found between the influence of judo training on the lifestyle of high school students and their dietary knowledge and habits with 79% of judo athletes demonstrating better nutrition awareness and healthier eating patterns compared to 67% of physically inactive individuals. The presented results highlight the need for efforts to increase nutritional knowledge among high school students as well as actions to enrich their diet with edible oils.

2.20. Elaboration of Peanut- and Nut-Based Yogurts

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The aim of this work is to elaborate and characterize peanut- and nut-based yogurts as an alternative to animal milk-based yogurt for people suffering from lactose intolerance or allergy to animal milk proteins and for those who are vegetarian.

This study consists of manufacturing drinking yogurt according to two different recipes, one yogurt made from a mixture of 50% nut milk and 50% peanut milk (PNY) and another prepared from 50% nut milk and 50% roasted peanut milk (rPNY), which were produced under the same conditions; then, this study evaluates the physicochemical, microbiological and sensory parameters of the products obtained in order to assess their suitability for replacing a fermented cow's milk product.

The results show that there is no difference between the two yogurts (PNY) and (rPNY) in terms of pH, total solids, fat, and acid index. However, differences are noted in terms of viscosity, total and reduced sugar content, protein content, and peroxide value. Undesirable germs are completely absent from both types of yogurt products, which shows the good quality of our products. Finally, sensory analysis revealed that plant-based yogurt is appreciated by experts with acceptance rates of 80% (PNY) and 100% (rPNY).

The physicochemical, microbiological and sensory analyses in this study show that plant-based milk can offer a sustainable alternative and substitute to cow's milk.

2.21. Evaluation of Functional Properties of Roasted Lentil and Faba Bean Flours

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The use of legumes in Europe is increasing due to their high protein content, so it is essential to ensure the production of high-quality and safe legume products. Different processing methods are used to make legumes digestible and free from antinutritional factors in the human diet. Roasting is the main method of converting raw legumes into an edible product. This process not only cooks the legume but also changes the composition of the phenolic compounds, resulting in legume products with improved sensory properties and more convenient further use in the development of various food products. This study compared roasted legume flours by examining properties such as water and oil absorption capacity, moisture content, density, swelling power, color analysis, foaming ability and stability, emulsion activity and stability, gelatinization temperature, and concentration. Based on the results of this study, it can be concluded that the use of roasted flour in food production is more desirable than raw flour. This study showed that roasting improves the functional properties of legume flour, such as water and oil absorption capacity, swelling capacity, emulsion stability, and gelation. Roasted legumes showed an obviously darker color, indicating the effect of roasting on the constituents of the sample. The study showed that roasted legume flour is significantly more beneficial for improving functional properties than raw flour. Further research comparing the effect of roasting on the reduction in antinutritional factors is necessary.

2.22. Evaluation of Preliminary Pharmacognostical and Phytochemical Properties of Leaves and Stems of Momordica charantia

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Introduction:

Momordica charantia is a perennial climbing vine of the Cucurbitaceae family. The fruits, seeds and leaves are known in tropical regions for their antidiabetic potential. It is traditionally used as both food and medicine in various diseases including menstrual

problems, constipation, malarial fever, HIV AIDS, sores and wound infections. The objective of the present study was to evaluate the preliminary pharmacognostic, phytochemical and nutritional parameters of the leaves and stems of the plant.

Methods:

The plants were collected from a local garden, and authentication was performed by the botanist. Morphological and microscopical studies of the leaf and stem of the plant were conducted. The plant parts were dried in shade and powdered for further study. The physicochemical evaluation of the powdered plant material was performed by determining the moisture content, ash value and extractive value. The successive solvent extraction was carried out in solvent with increasing polarity. The qualitative phytochemical study was conducted with the successive solvent extracts. Total tannins and steroids were determined in the extracts of leaves and stems.

Results:

The morphological evaluation was performed by accessing organoleptic parameters. The microscopical evaluation of the leaves and stems was carried out by taking transverse sections and conducting a powder microscopical study and a quantitative determination of leaf constants. The LOD of leaves was 10.45% and that of stems was 15.27%. The total ash value was 9.6% for leaves and 8.8% for stems. The water-soluble and alcohol-soluble extractive values for leaves were 23.11% and 17.56%, whereas for stems, they were 23.76% and 18.56%, respectively. The phytochemical screening showed the presence of alkaloids, proteins, glycosides, saponins and carbohydrates in the leaves, while flavonoids, steroids, alkaloids, and tannins were found in stems. The total tannins in the leaf extracts were 793.6 μg/mL, and the total steroids in the stem extracts were 32 μg/mL.

Conclusions:

The pharmacognostic and phytochemical evaluation can be used for the preliminary standardization of the plant.

2.23. Green Tea Kombucha Is Rich in Phenolic Compounds and Exhibits Cytotoxic Potential Against Cancer Cell Lines

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Kombucha is one of the fastest-growing fermented beverages in popularity worldwide due to the health benefits its regular consumption may provide, such as reducing cholesterol and blood sugar levels and combating oxidative stress, among others. However, there are still few studies evaluating the in vitro cytotoxic potential of the beverage against cancer cell lines. Therefore, we produced kombucha using green tea cultivated in the city of Registro, Brazil, characterized its phenolic profile using UPLC-MS^E, and tested the cytotoxic potential of the beverage against lung adenocarcinoma epithelial cells (A549), human colon carcinoma cells (HCT8), human liver cancer cells (HepG2), human umbilical vein endothelial cells (HUVEC), and normal human lung fibroblast cell lines (IMR90). The green tea kombucha presented 92 phenolic compounds, most of which were classified as flavonoids. The kombucha demonstrated a cytotoxic profile in all tested cancer cell lines, which was evidenced by growth inhibition (GI50), decreased cell viability (IC50), and lethal concentration (LC50). In line with this, we observed that the extract presented a selective index (A549 = 2.84; HCT8 = 1.74; HepG2 = 1.4; and HUVEC = 1.23) in relation to the normal cell line, as IMR90 was not affected by the treatment (IC50, IG50, and LC50 > 500 μg GAE/mL). It is believed that the flavonoids, which are the most abundant in kombucha, are capable of acting on crucial signaling pathways for tumor development. Our findings indicate that green tea kombucha is effective in promoting cellular health in vitro, and com-

plementary studies with animal and human models will be crucial to confirm these tested biological activities.

2.24. High and Low Adherence to Mediterranean and DASH Diet Patterns and the Risk of Heart Failure: A Meta-Analysis of Observational Studies

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Background: The relationship between heart failure (HF) and the Mediterranean and DASH diets is not well delineated. This meta-analysis aimed to assess the effectiveness of high adherence to the Mediterranean and DASH diets compared to low adherence in reducing the risk of incident HF (primary prevention of HF) and reducing all-cause mortality in patients with HF (secondary prevention of HF).

Methods: The reporting stages of this meta-analysis closely adhered to the PRISMA guidelines. A comprehensive literature search was undertaken for published papers in the PubMed, Embase, EBSCO, ICTRP, and the NIH clinical trials databases.

Results: A total of 16 reports from 14 studies were included in this paper. A significant inverse association was identified between high adherence to the Mediterranean diet model (compared to low adherence) and the risk of incident HF (OR = 0.77, 95% CI: 0.63–0.93, $p = 0.007$) among patients without a previous diagnosis of HF. Similarly, there was a significant and inverse relationship between high adherence to the DASH diet (compared to low adherence) and the risk of incident HF (OR = 0.83, 95% CI: 0.70–0.98, $p = 0.03$) among patients without a previous diagnosis of HF. High adherence to the Mediterranean diet model (compared to low adherence) was associated with lower all-cause mortality (OR = 0.88, 95% CI: 0.78–0.99, $p = 0.03$) among patients with HF.

Conclusions: This paper demonstrated that high adherence to the Mediterranean and DASH diets significantly reduced the risk of incident HF among individuals without a previous diagnosis of HF, whereas only high adherence to the Mediterranean diet was associated with lower all-cause mortality among patients with HF.

2.25. How Plant-Based Diets Influence Mental Health: Mitigating Depression and Anxiety

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Depression and anxiety are common conditions that greatly hinder daily functioning and aggravate chronic diseases. Recent studies suggest that dietary changes can enhance mood and quality of life without relying on pharmacological therapies. Research indicates that individuals who consume whole foods experience fewer depressive symptoms, and vegetarians tend to have better moods compared to omnivores. Depression and anxiety are associated with brain inflammation and neurotransmitter imbalances. Plant-based diets, which are high in antioxidants and phytochemicals, can help heal brain damage, reduce inflammation, and restore neurotransmitter balance. For example, quercetin from plants acts as a monoamine oxidase (MAO) inhibitor, boosting levels of serotonin (5-HT), dopamine (DA), and norepinephrine (INN). Conversely, arachidonic acid (AA, C20:4n, ω-6), found in animal products, can cause prolonged inflammatory responses linked to depression and anxiety. While increasing ω-3 intake is often suggested for mood improvement, evidence points to greater benefits from plant-based diets. Studies have shown that vegetarians

experience notable mood improvements compared to those who eat fish or meat. Plant-based diets include foods such as walnuts, flaxseeds, chia seeds, and leafy greens, which provide alpha-linolenic acid (ALA), which the body converts into ω-3s, including eicosapentaenoic acid (EPA) and docosahexaenoic acid (DHA). Additionally, plant-based diets enhance tryptophan (Trp) utilization, which is crucial for 5-HT production. Therefore, a systematic review was conducted according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, searching PubMed and ScienceDirect using several keywords such as "plant-based diets" for studies published from 2017 to 2024. In conclusion, given the increasing prevalence and healthcare costs of these mental health issues, this research aims to examine the impact of dietary patterns, particularly plant-based diets, on mental health, and their potential to reduce symptoms of depression and anxiety through dietary modifications.

2.26. Impact of Catechin Supplementation in Older Adults with Sarcopenia on Circulating Biomarkers of Health Status: A Systematic Review of Clinical Trials

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Introduction: Sarcopenia is a multifactorial syndrome characterized by musculoskeletal involution with loss of skeletal and muscle mass and strength, leading to dependence, poor quality of life, and mortality. In this respect, nutritional supplementation with antioxidants could mitigate these issues. Therefore, green tea extract (rich in catechins) may improve musculoskeletal function by influencing age-related cellular processes mainly related to oxidative stress. We aimed to evaluate the current evidence in the literature on catechin supplementation in older adult patients diagnosed with sarcopenia.

Methods: Based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, we systematically reviewed studies indexed in databases to assess the effects of catechins on hematological, biochemical, hormonal, inflammatory, and muscle damage biomarkers, physical performance, anthropometrics, vital signs, and emotional symptoms. Original articles published up to 5 May 2024 with a controlled trial design comparing a group supplemented with catechins with a control group were included.

Results: Among the 97 records identified in the search, 7 studies met the inclusion and exclusion criteria. Overall, catechin supplementation gave statistically significant decreases (p 0.05) in blood leucocytes and the hormone myostatin. The muscle mass index of both legs and arms increased significantly (p 0.05) after catechin supplementation.

Conclusions: Oral supplementation with catechins improves muscle mass and strength, leading to therapeutic benefits in age-related patients with sarcopenia. The anti-inflammatory and antioxidant effect of catechins could be due to the suppression of transcription factor NF-κß, improving the state of skeletal muscle.

2.27. Impact of In Vitro Gastrointestinal Digestion on Polyphenolic, Anthocyanin Content, and Antioxidant Activity of Berries and Their Extracts

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Anthocyanins are notable polyphenols with extensive health benefits primarily found in red and purple plant foods. However, the low bioavailability of these phytonutrients has been a challenge that may hinder their beneficial effects. Therefore, concentrated forms of these compounds in the form of extracts have become prominent as dietary supplements or nutraceuticals. Whether these products are superior to the consumption of whole foods rich in anthocyanins in terms of bioavailability remains unclear. The aim of the present study is to investigate the changes in polyphenol content, anthocyanin content, and antioxidant activity of acai berry and blueberry during the in vitro gastrointestinal digestion stages following the INFOGEST protocol. Freeze-dried powder was utilized to represent whole foods and compared to their corresponding extracts prepared in laboratory conditions, representing concentrated dietary supplements. Polyphenol content, anthocyanin content, and antioxidant activity were measured at different stages of digestion (oral, gastric, and intestine for powders; gastric and intestine for extracts). Data were analyzed to determine the significant differences between the powders and extracts using two-way ANOVA. The results showed no significant differences in polyphenol and anthocyanin content between forms (powder and extract) for both acai and blueberry ($p > 0.05$). For antioxidant activity, significantly higher antioxidant levels were observed in extracts (gastric: 22.7 $\pm$ 6.6 and intestine: 11.3 $\pm$ 2.7 nmole/µL, Trolox equivalents) compared to powders (gastric: 16.2 $\pm$ 4.7 and intestine: 9 $\pm$ 1.3 nmole/µL, Trolox equivalents). Acai berry consistently showed higher polyphenol and anthocyanin contents as well as antioxidant activity compared to blueberry. In addition to this, polyphenol content and antioxidant activity were significantly reduced after each digestive stage, whereas no significant changes were observed in anthocyanin content.

2.28. Innovative Dietary Solutions: Macroalgae Amino Acids for Differentiated Nutrition

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Veganism has recently become more popular for ethical, health, and environmental reasons. Despite its benefits, many vegans struggle to obtain a complete essential amino acid profile from plant sources alone. The diversification of protein sources is crucial for a balanced amino acid intake and adequate nutrition. Macroalgae, a nutrient-rich food that has long been consumed in Asia, offers one solution. Essential and non-essential amino acids, vital for optimal health, are found in edible macroalgae species. In this study, the amino acid profiles of seven macroalgae species—four brown algae species, namely *Pelvetia canaliculata*, *Saccharina latissima*, *Fucus vesiculosus* and *Laminaria ochroleuca,* and three red algae species, namely *Gigartina pistolita*, *Mastocarpus stellatus*, *Chondrus crispus* from the northwest coast of the Iberian Peninsula—were analyzed using HPLC with fluorescence detection. Essential amino acids were found in all algae samples, except for tryptophan, which was absent in all but *Fucus vesiculosus*. The amino acids detected in greater quantity

in the Phaeophyceae species were aspartic and glutamic acids. These amino acids are responsible for the "unami" flavor. In the Rhodophyta group, aspartic and glutamic acids are also present in large quantities, but higher concentrations of histidine and lysine were found. The findings of this study are of utmost importance, revealing that macroalgae are a valuable food source that provides a comprehensive profile of essential amino acids. This is particularly crucial for personalized nutrition plans for vegetarian and vegan diets, shedding new light on the potential of macroalgae in the field of nutrition.

2.29. Kombucha and Its Nutrients: A Qualitative Analysis of Vitamin C Comparing Green Tea and a Plant-Based Drink Fermentation

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Introduction: Kombucha, a plant-based beverage originating from China over 2000 years ago, is primarily known for its health benefits attributed to catechins (polyphenols) present in Camellia sinensis leaves. The fermentation of green tea by a colony of bacteria and yeast cultured on a cellulose film called SCOBY (Symbiotic Culture of Bacteria and Yeasts) produces kombucha, including numerous biochemical changes and generating bioactive compounds that are crucial for health. This study aimed to compare the antioxidant capacity and physicochemical parameters of green tea with kombucha to determine changes in vitamin C levels before and after fermentation. Material and Methods: Experimental data were collected manually, reflecting common practices among kombucha producers worldwide. The following variables were evaluated: pH, density, room temperature during fermentation, alcohol content (%), ^{0}BRIX (soluble solids), and vitamin C presence. Results: A statistical analysis using PAST software (https://palaeo-electronica.org/2001_1/past/pastprog/index.html, accessed on 1 November 2024) indicated significant differences (p 0.01) in density and ^{0}BRIX decrease by the 6th day of fermentation (indicating active fermentation). The fermented drink exhibited a notable 31% decrease in pH and a substantial 65% increase in vitamin C levels (which increased by 17% (p 0.01) after the second fermentation cycle) compared to green tea. Conclusions: Thus, the study results indicate that fermentation leads to the formation of important organic acids and significantly increases vitamin C levels in unflavored kombucha obtained from the first and second fermentation cycles.

2.30. Nutrient Analysis and Sensory Evaluation of Vegetable Cakes

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Introduction: Snacks are a crucial part of dietary patterns, providing energy and nutrients. However, micronutrient deficiency is a public health concern, especially in Africa. The aim of this study was to develop cakes fortified with cabbage (CC), Tete (TC), and Amunututu (AC), and to assess their nutrient content and acceptance.

Methods: Cabbage, Tete (*Amaranthus hybridus*), and Amunututu (*Malabar spinach*) were freshly purchased, sorted, blended, and mixed with cake batter before baking. Nutrient analysis was performed using the Association of Official Analytical Chemists (AOAC) methods and data were analyzed using SPSS V26.

Results: There were significant differences in the nutrient content of cake samples. Moisture content ranged from 32.79 ± 0.04% in plain cake to 60.58 ± 0.03% in CC. The protein content of the plain cake was highest (9.46 ± 0.10%) among all samples. The fat content ranged from 4.49 ± 0.03% in CC to 13.40 ± 0.03% in plain cake. There was a significant difference in the fiber content of the samples. The ash content of the samples ranged between 0.75 ± 0.05% in CC and 1.03 ± 0.01 in TC. There was no significant difference between the ash contents of TC and AC. The carbohydrate content of the samples ranged from 27.28 ± 0.13% in cake with all three vegetables to 43.48 ± 0.12 in plain cake. The

potassium content of the cake samples ranged from 294.67 ± 0.00 mg/100 g in plain cake to 425.41 ± 43.58 mg/100 g in TC. The micronutrient contents of the cakes were similar across samples. On a scale of 1–5, panelists ranked AC as 2.33 ± 0.89 on average and plain cake as 4.83 ± 0.39. There was no significant difference in acceptability ranking for CC (3.67 ± 0.65), TC (3.17 ± 0.84), and cake with all three vegetables (3.08 ± 1.17) ($p > 0.05$).

Conclusions: Cakes with vegetables were nutrient-dense and high in fiber, offering a healthier alternative to plain cakes. Respondents preferred plain cakes, which was likely due to taste familiarity. However, cakes with vegetables were well accepted, except AC.

2.31. Nutritional Characterization of Neglected and Unexploited Seed (Oil) from Klainedoxa gabonesis (Shrew African Bush Mango): A Novel Study

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Shrew African bush mango (Ujiri Nkakwu), a neglected and unexploited oil seed plant, was examined for its nutritional profiles as well as its oil compositions. The pulverized seeds were subjected to proximate analysis, and standard methods were employed to determine the fatty acid, phytosterol, and tocopherol profiles, whereas the amino acid profile was ascertained from the de-fatted cake. Proximate composition showed that it is very rich in fat, followed by protein and then fiber, while the least was moisture; it also has a very high calorific value of 2364.39 ± 10.30/kcal. Among the six essential amino acids, L-leucine was the most prevalent, whereas glycine was the most prevalent non-essential amino acid (n = 5). According to the fatty acid profile, stearic acid was the main saturated fatty acid found in the oil, while oleic acid was the main polyunsaturated fatty acid present in the sample, which was followed by linoleic acid at 15.1204 µg/mL. Betulin, campesterol, stigmasterol, sitosterol, cuperol, and avenasterol are the sterols identified with avenasterol being the major phytosterol present in the oil. According to these findings, Shrew African Bush Mango seeds might make great sources of oil. Consequently, Shrew African Bush Mango contains a high content of essential amino acids and protein for food or feed.

2.32. Phenolic Profile and Antioxidant Capacity of Some Algerian Olive Oil Cultivars

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Olive trees have been able to adapt to different pedoclimatic conditions over the centuries. Olive plantations represent a strategic sector and contribute to environmental and biodiversity conservation. Olive and olive oil production is of great socio-economic importance. The aim of the present work is to assess the phenolic profile and the antioxidant potential of different varieties of Algerian olive oils (*Aharoun*, *Agnaw*, *Adjeraz*, *Aymel*). Their total phenolic content (TPC) and the total flavonoid content (TFC) were determined spectrophotometrically. Antioxidant activity was tested using reducing power and 2,2-diphenyl-1-picrylhydrazyl (DPPH) assays. *Aharoun* olive oil showed the highest contents of polyphenols (177. 21 ± 2.59 mg GAE/Kg) and flavonoids (9.34 ± 1.27 mg QE/Kg), whereas *Aymel* showed the lowest contents of polyphenols (40.11 ± 3.89 mg GAE/Kg) and flavonoids (4.38 ± 0.71 mg QE/Kg). The former olive oil (*Aharoun*) exhibited the highest reducing power (0.38 ± 0.037) and was the most effective against DPPH free radicals (95.46 ± 0.39%). However, *Adjeraz* presented the weakest reducing power (0.09 ± 0.004) and free radical scavenging activity (43.60 ± 2.52%). A positive correlation between the oils'

phenolic/flavonoid contents and antioxidant activity was observed. The results showed that the olive oils contain significant quantities of phenolics and flavonoids with interesting antioxidant activity. These findings support the need to intensify olive cultivation in Algeria to improve food security and promote the growth of the national economy.

2.33. Protective Action of In Vitro Orogastric Digests of Nannochloropsis gaditana Against Helicobacter pylori Infection

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Helicobacter pylori (*H. pylori*) is one of the most frequent human pathogenic bacteria, affecting more than 50% of the world's population. Its infection is associated with oxidative stress and chronic inflammation. Although eradicative antibiotics-based treatment is indicated, their multiple side effects and the increasing antibiotic resistance highlight the urgency of seeking alternative approaches. *Nannochloropsis gaditana* (*N. gaditana*) has attracted increasing attention due to its adaptability, sustainability, and high nutritional value. Also, multiple biological properties have been associated with extracts or isolated compounds from this microalga. The objective of our study was to evaluate the impact of simulated orogastric digestion on the antioxidant, anti-inflammatory, and antibacterial activities of *N. gaditana* as a basis of its protective effects against *H. pylori* infection.

A *T. gaditana* biomass was subjected to a combined pretreatment of freeze/thaw cycles and ultrasounds. The orogastric digestion was simulated following the INFOGEST protocol[3], and the antioxidant activity of the biomass and digest were evaluated using the ORAC and ABTS assays. To evaluate the antibacterial activity, a quantitative analysis of the colony-forming units of *H. pylori* was performed in the presence of microalga or its digest. In addition, the antioxidant (reactive oxygen species, ROS, levels) and anti-inflammatory activity (interleukin, IL-8, levels) were evaluated in human gastric adenocarcinoma cells under basal and *H. pylori* infection.

T. gaditana showed antibacterial activity against *H. pylori.* The digestive process allowed the release of potent peroxyl and ABTS radical scavengers and the degradation of pro-inflammatory compounds. In basal gastric cells, no effects on the ROS levels were observed. However, after *H. pylori* infection, both microalga and its digest increased the ROS levels produced by cells, favoring a cell defensive mechanism against the pathogen. Our findings support the protective role of microalga *N. gaditana* and its promising future as a natural alternative option in the treatment of *H. pylori* infection.

2.34. Proteomic Approaches to Identify Antioxidant Peptides from the Microalga Tetraselmis chuii After Its Simulated Orogastric Digestion

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Over the last few years, the interest in bioactive peptides derived from microalgae has grown significantly due to their potential health benefits. Within the different microalgae species, the green microalga *Tetraselmis chuii* stands out for its protein profile composition and essential amino acids. The proteomic analyses of simulated gastric or gastrointestinal digestion phases, both in vitro and in silico, have become one of the most widely investigated strategies to evaluate bioactive peptides from microalgae proteins.

T. chuii biomass was pretreated with a combination of freeze–thaw cycles and ultrasounds. Proteomic analysis was carried out by HPLC coupled with tandem mass spec-

trometry. The functional analysis of the proteome was carried out with OmicsBox software (https://www.biobam.com/omicsbox/, accessed on 1 November 2024). The annotated proteins were classified into three functional groups—cellular component, molecular function, and biological processes—using BLAST 2GO Methodology. In silico gastric digestion was performed by the Rapid Peptides Generator (RPG); pepsin was selected as the digestive enzyme. In parallel to this, in vitro orogastric digestion was carried out following the INFOGEST protocol. The antioxidant capacity of the digests was evaluated by ORAC and ABTS assays.

The proteomic and functional analysis allowed for the identification of 287 annotated proteins, which were classified into three different groups: 254 sequences (33.5% of total) were associated with a biological process; 222 sequences (35.5%) were classified as proteins involved in molecular function; and 240 sequences (31.0%) were identified as proteins constituent of a cellular component. In silico gastric digestion of the identified proteins revealed the release of 14,774 peptides, most of them (79%) containing between two and ten amino acids. Among the low-molecular-weight peptides produced during the in silico analysis, 24% contained aromatic amino acids, which could be responsible for the radical scavenging capacity determined in the in vitro orogastric digests of *T. chuii*.

2.35. Rational Design of Plant-Based Functional Products for Older Adults: Fabrication, Oral Processing, Palatability, and Digestibility of Co-Extruded Cereals

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Aim

The disparity between the human lifespan and health span requires novel strategies, interventions, and dietary solutions to promote healthy aging. This research, part of the EAT4AGE JPI-HDHL project, concentrates on designing and assessing co-extruded plant-based functional cereals customized for senior individuals. Enriched with maca root powder and olive leaf extract, the product targets the nutritional deficiencies observed in older adults, particularly focusing on providing high-quality, easily digestible proteins.

Method

First, a palatable vegan food alternative for seniors was designed using four plant-based flours (teff, chickpea, maize, and rice). Then, a co-extrusion process was optimized to create three ready-to-eat puffed cereal prototypes: a control, a maca-enriched product, and a maca with olive leaf extract product. The cereals underwent sensory tests by senior subjects and their digestive breakdown was investigated using a semi-dynamic in vitro digestion model mimicking a senior gut coupled with proteomic analyses (SDS-PAGE, LC-MS/MS peptide profiling, and DIAAS determinations).

Results

Surpassing commercially available products, the developed products were shown to have a rich macronutrient profile with over 12% (*w*/*w*) protein, 20% (*w*/*w*) fat, and low sugar content (5% *w*/*w*). Texture analysis revealed that adding functional ingredients reduced product hardness, indicating improved chewability. Further, an untrained consumer panel (n = 21, age 73 $\pm$ 5) confirmed the high palatability and overall acceptability of the functional product. Lastly, the in vitro DIAAS of the product was confirmed to be 80%, exceeding the typical digestibility range of plant-based products (40% to 80%) like kidney beans, lentils, and chickpeas.

Conclusions

This study highlights the potential of designing palatable functional products for healthy aging. Moreover, this study shows that co-extrusion enables the creation of calorically dense plant-based products for people over 65 with improved protein digestibility. Thus, this work contributes to developing tailored foods that promote health and well-being in the aging population.

2.36. Red Banana (Musa acuminata Colla cv. Red) Pulp and Peel-Based Isotonic Beverage for Holistic Cellular Hydration and Nutrition

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Currently, most synthetic-based beverages are hypertonic drinks. In order to maintain osmolality and its ionic potential of 250 m Osm/kg, the possibilities of using sugar sweeteners in functional drinks while maintaining their osmolality properties are limited. Hence, the present study used exclusion zone (EZ) water to create an isotonic fruit drink with natural components including high levels of bioactive compounds, along with macro-, micro-, and trace elements, which can be included in an isosmotic cellular health diet. This study uses the pulp and peel of red bananas (*Musa acuminata* Colla cv. Red) to create isotonic formulations using exclusion zone (EZ) water produced by a self-made device. Eight ingredients with varying weight percentages were combined using a proprietary mixing device. The results were analyzed using Stat-Ease Inc. (USA) Design-Expert 10.0 software. The D-optimal mixture design methodology was used to study the results, revealing that EZ water (90.353 percent), red banana pulp (4.941 percent), red banana peel (0.688 percent), coconut (3.353 percent), isabgol (0.136 percent), propolis (0.024 percent), okra mucilage (0.029 percent), and almond gum (0.477 percent) is the optimized formulation mixture to attain osmolality (285.593). The achieved osmolality was the same as that of serum, which is a common hydration marker. Further, we evaluated hydration using serum, urine, and saliva samples. The findings revealed that a significant drop in urine volume (1766.45 80.80 mL) and the salivary flow rate (0.56 0.05 g/min to 0.66 0.04 g/min) along with a significant increase in serum [Na^+] (1141.59 0.22 mmol/L) and osmolality (288.56 0.61 mmol/kgH_2O). A maximum of 1.47 was recorded for the specific gravity of the formulated isotonic beverage. Its micro- and macronutrient composition was as follows: sodium (1.23 mg/100 g), magnesium (44.77 mg/100 g), calcium (5.59 mg/100 g), energy (41.92 Kcal/100 g), protein (0.17%), soluble dietary fiber (0.87), total sugars (11.73%), carbohydrates (8.18%), vitamin B6 (0.31 mg/100 g), and vitamin C (35 mg/100 g). The findings indicate that this beverage is unique in aiding rehydration because it provides the right balance of nutrients and hydration for cells to stay healthy.

2.37. Reducing Agricultural Land Use Through Plant-Based Diets: A Case Study of Romania

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Introduction

In Romania, adopting a plant-based diet could have a profound impact on agricultural land use, reflecting broader global trends. This study investigates the potential land savings by analyzing the land required to produce various sources of calories. The focus is on understanding how a shift in dietary habits could contribute to more sustainable land use, environmental conservation, and the achievement of Sustainable Development Goal (SDG) 12, which aims to ensure sustainable consumption and production patterns.

Methods

The research employs data from governmental sources (Romanian Ministry of Agriculture) and international reports from organizations (FAO). It examines the land-use efficiency of different foods, comparing meat, dairy, grains, and legumes. The analysis involves calculating the land required per calorie produced and extrapolating these findings to model the impact of a nationwide dietary shift.

Results

Preliminary findings indicate that plant-based foods, such as grains and legumes, require significantly less land per calorie compared to animal-based products. For example, producing one calorie from beef requires substantially more land than producing the same amount of calories from beans. If Romania's adult population transitioned to a plant-based diet, the potential reduction in agricultural land use could be as high as 75%. This transition would not only free up land for other uses but also reduce the pressure on natural ecosystems and lower greenhouse gas emissions from agricultural activities.

Conclusions

Transitioning to a plant-based diet among Romania's adult population presents an opportunity for substantial agricultural land savings and environmental benefits. Such a dietary shift would support the conservation of natural resources and contribute to national and global sustainability goals. Moreover, the proposed model can be applied to other countries, providing a scalable solution to reduce agricultural land use worldwide. Efforts must coordinate to educate the public on plant-based diet benefits and develop policies for sustainable agriculture.

2.38. Substitution of Dairy with Plant-Based Alternatives in German Children and Adolescents: A Modeling Analysis on the Nutritional and Ecological Sustainability Impact

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Introduction

Dairy is an integral part of the diet of children and adolescents, but plant-based dairy alternatives (PBDAs) are becoming increasingly popular as part of a sustainable diet. As PBDAs have a different nutrient profile than dairy, the potential impact of replacing dairy with PBDA was analyzed using model analyses in terms of nutrient adequacy and ecological indicators.

Methods

Using 7676 three-day-weighing-dietary records from 1072 DONALD study participants ($3 \leq 19$ years; 2000–2022), changes in total daily energy and nutrient intake (as % of German dietary reference intake (DRI)) and estimated greenhouse gas emissions (GHGEs) and land use (LU) per 1000 kcal/day were calculated. For this purpose, 25%, 50%, 75% and 100% of the current dairy intake were replaced by the same amount of PBDA. The energy and nutrient content of PBDAs (total and fortified) were calculated according to current consumption patterns. Differences to the current intake were analyzed using analyses of variance (ANOVA $\alpha = 0.05$).

Results

The substitution of dairy with PBDAs showed a significant reduction in GHGE (up to 19.3%) and LU (up to 11.9%). Intakes of protein, vitamin B2 and B12 decreased with increasing substitution levels. Protein intake exceeded DRI even in 100% substitution models, but Vitamin B2 and B12 reached DRI only in models with fortified PBDA. Calcium intake was below the DRI in the current diet (median 76%) and was further reduced with increasing levels of substitution irrespective of fortification. Iron intake improved to almost the level of DRI.

Conclusions

Substituting dairy with PBDAs substantially reduced ecological GHGEs and LU. Protein is no nutrient of concern; a sufficient intake of Vitamin B2- and B12-fortified products is advisable. The initially low calcium intake deteriorated further with the substitution of dairy by PBDAs. Potential health consequences need to be investigated further.

2.39. The Anti-Inflammatory Potential of Protease Inhibitors from Legume Seeds in the Gut

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Protease inhibitors (PIs) are small proteins expressed in the storage tissues of legume seeds, which are also called pulses. PIs are more than just antinutritional factors. Preclinical studies have shown that pulse PIs possess anti-inflammatory and anti-carcinogenic activities in the gut through their specific inhibition of matrix metalloproteinases (MMPs), which are key players in chronic gut inflammatory diseases. This study aims to investigate the PIs embedded in processed and digested pulse matrices and the PI-mediated inhibition of MMPs oversecreted by adult gut cells under induced inflammation.

Selected raw peas, faba beans and lupins from Danish pulse varieties will be used to characterize PIs pre- and post-processing and post-simulated human digestion (INFOGEST) by methods such as trypsin (T) and chymotrypsin (C) inhibitory activity (IA) assays, proteomics and an enzyme-linked immunosorbent assay (ELISA). The soluble protein fraction of the digests will be tested in vitro in newly developed cell models with induced inflammation (macrophages/DCs with Caco-2/HT-29 cells). Potential PI-driven MMP inhibitory activity will be detected, and its effects on the intestinal epithelium's integrity will be defined. Commercially available soybean PIs will be used as a reference in each experiment.

Successful outcomes will include (1) an understanding of the impact of crop-growing conditions, the pulse matrix, processing and adult human digestion on the integrity, activity and bioactivity of PIs and (2) deep insights into PI's causative role in the inhibitory process of the MMPs involved in immune-related gut disorders.

The unexplored immune-regulatory role of pulse PIs in the human gastrointestinal tract and PI-driven MMP inhibition will be investigated. This novel model system developed for the characterization of pulse PIs may apply to other legume varieties or raw materials than those included in this study. The knowledge obtained could change the current perception of pulse PIs from antinutrients to health-promoting proteins that can potentially mitigate and prevent gut-associated inflammatory diseases.

2.40. The Antimicrobial Activity of Curry Leaf (Murraya keonigii) Extracts: An In Vitro Study

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Introduction: Curry leaves, scientifically known as *Murraya keonigii* (L.) Spreng, are well known for their strong fragrance, their role in Asian cooking, and their many therapeutic benefits, which include their antidiabetic, antioxidant, antibacterial, and anti-inflammatory properties.

Aim: This research study examines the antibacterial activities of curry leaf extracts against different bacterial strains in a laboratory setting utilizing ethanol and aqueous solvents.

Methodology: The curry leaves were dried using air, ground into a powder, and soaked in ethanol and water to produce extracts. The antibacterial activity of these extracts was assessed using the agar well diffusion technique against *Staphylococcus aureus*, *Bacillus subtilis*, *Escherichia coli*, *Salmonella* spp., and *Candida albicans*. The extracts were analyzed using gas chromatography–mass spectrometry (GC-MS) to identify bioactive chemicals.

Results: The findings indicated substantial antibacterial activity with ethanol extracts demonstrating higher effectiveness. The minimum inhibitory concentration (MIC) and minimum bactericidal concentration (MBC) were measured to assess the efficacy of the ethanol extract, particularly against *Bacillus* sp. and *Candida albicans*. The GC-MS analysis revealed the presence of important chemicals, including hexadecanoic acid, methyl ester, cyclotetrasiloxane, and octamethyl, in the extracts. These compounds are likely responsible for the extracts' antibacterial activities. Statistical analysis validated the significance of the data (p 0.05).

Conclusions: This work emphasizes the potential of *Murraya keonigii* extracts as natural antibacterial agents, supporting the need for the future investigation of their pharmaceutical applications.

2.41. The Antimicrobial and Antioxidant Properties of Syzygium smithii, an Australian Bush Food

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Introduction

Many native Australian plants, including *Syzygium* spp., have been used as traditional medicines by indigenous Australians; however, they have been underutilized in modern medicine due to a lack of scientific studies. The berries of *Syzygium smithii,* commonly known as lilly pilly, are considered to be a protective food and have not been investigated previously. This is a preliminary study of the antimicrobial and antioxidant properties of the berries and leaves of *Syzygium smithii*.

Method

Syzygium smithii berries and leaves were extracted using an in-house cold extraction method in ethanol and water. Their antimicrobial properties were investigated using disc diffusion and minimum inhibitory concentration (MIC) assays against Gram-positive (*Bacillus cereus*, *Enterococcus faecalis*, *Listeria monocytogenes*, *Staphylococcus aureus*) and Gram-negative (*Escherichia coli*, *Klebsiella pneumoniae*, *Pseudomonas aeruginosa*, *Salmonella enterica*) bacteria. Their antioxidant capacity was investigated using 2,2-diphenyl-1-picrylhydrazyl (DPPH) radical inhibition, ferric reducing antioxidant power (FRAP), total phenolic content (TPC), and total flavonoid content (TFC) assays.

Results

During the disc diffusion assay, the ethanolic berry and leaf extracts showed inhibitory potential against all Gram-positive bacteria, except for *S. aureus* for the berry extract. The MIC of the ethanolic leaf extract was found to be 25 mg/mL against all bacteria excluding *S. enterica*, and that of the aqueous leaf extract was between 12.5 and 25 mg/mL against all bacteria excluding *K. pneumoniae* and *S. enterica*. TPC and TFC were found to be 663.44 μg

gallic acid/mg and 489.80 µg quercetin/mg, respectively, and the antioxidant capacity of the aqueous berry extract had an IC_{50} of 38.79 µg/mL against DPPH.

Conclusions

In conclusion, *Syzygium smithii* has the potential to be utilized by modern medicine as a potential antimicrobial and antioxidant agent. Further studies are needed to confirm these biological activities of *Syzygium smithii*.

2.42. Updating the Italian Food Composition Database (BDA) for a More Accurate Nutritional Assessment of Plant-Based Diets

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Introduction. Plant-based diets are growing in popularity worldwide, which is driven by health and environmental concerns. This has led to a greater demand for plant substitutes for animal-based foods (e.g., meat analogues), emphasizing the need for an up-to-date food composition database (FCDB) for vegetables and plant-based foods. Our aim is to update the Food Composition Database for Epidemiological Studies in Italy (BDA, https://bda.ieo.it, accessed on 1 November 2024), focusing on the Vegetables and plant-based foods group, and to use this updated tool to assess the nutritional adequacy of plant-based diets followed by a sample of adults accessing the European Institute of Oncology in Milan. In this work, we present some preliminary results of the BDA update.

Methods. The BDA is compiled according to international standards (www.eurofir.org, accessed on 1 November 2024) and involves the use of data from pre-existing sources: national and international FCDBs, scientific articles, nutritional labels, and analyses from food industries and laboratories. When no data are available, the recipe approach is implemented.

Results. The Vegetables and plant-based foods group comprises six subgroups and 23 food categories, currently including 175 items. Efforts will be needed to update the composition data of pre-existing food items and to add others by consulting the latest consumption data and verifying the availability of foods in the Italian market. For each food item, data on 89 components will be compiled: edible part, energy (kcal, kJ), water, 17 macronutrients, 13 minerals, 15 vitamins, 21 fatty acids, 18 amino acids and alcohol. This new BDA update will be integrated into a web application to measure dietary intake.

Conclusions. The BDA project aims to offer an inclusive FCDB in terms of items and components. This update will serve as a valuable resource for epidemiological studies focused on plant-based diets. The dietary assessment results will support the development of recommendations to promote the consumption of nutritionally balanced plant-based diets.

3. Session 2: Innovation in Dietary Choices

3.1. Three-Dimensional Vegan and Hybrid Meat Analogues: Effect of Cooking and In Vitro Digestion

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Introduction: Health and sustainability are current trends in the market of food products with fewer or no animal-derived ingredients. Three-dimensional technology is a highly promising tool for the development of novel and palatable food products. More research is needed to elucidate how these trends and technologies actually affect consumer health.

Aim: This work aims to study the composition and effect of cooking and the in vitro digestion of a vegan product (bacon) and a hybrid product (veal cutlet) developed using 3D technology.

Materials and methods: Vegan bacon and hybrid veal cutlets were obtained from Cocuus enterprise. Both products were cooked using a frying pan with a negligible amount of oil. Their general composition was analyzed in both the raw and cooked states, which was followed by in vitro digestion (INFOGEST method). Digestibility parameters and the oxidation degree (TBARs) were assessed.

Results: Both analogues showed lower fat and energy values than their respective conventional products. The fatty acid profiles were healthier in the analogue products with a significantly lower amount of saturated fatty acids. Cooking resulted in a considerable loss of moisture (7–11%) in both products, giving rise to the concentrations of the rest of the components. The total digestibility was approximately 63% for both products. Protein digestibility was higher for hybrid products (78.32%), which was probably due to their animal origin, than for vegan products (65.88%). Lipid digestibility was 40.68% for bacon and 55.54% for hybrid products. Additionally, both products increased their oxidation degree during the digestion process.

Conclusions: Three-dimensional technology seems to be a suitable process to develop healthier and sustainable food products.

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3.2. Fermented Papaya: Available Formulations from Online Markets

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Introduction: Fermentation is a process of central metabolism in which an organism converts a carbohydrate, such as starch or sugar, into an alcohol or an acid. *Carica papaya*, also known as papaya or pawpaw, belongs to the *Caricaceae* family and has four genera in the world. Due to papaya's health benefits, this fruit is considered a valuable nutraceutical with an exceptionally diverse composition, encompassing vitamins and enzymes. Fermented papaya preparations, produced by the fermentation of *Carica papaya*, are a well-known food supplement that exhibit anti-inflammatory, antioxidant, and immunostimulatory action. **Objectives:** A descriptive study was carried out to find out which commercial fermented papaya formulations are available in the market. **Methods:** Data were gathered during 2021 from February to March. The main available commercial fermented papaya formulations were searched for on international online shopping sites, such as Amazon®, Naturitas®, Ebay®, Nutribio®, Life Natura®, and Fruugo®. A search was conducted by using the following keywords: "fermented papaya", "FPP®—Fermented Papaya Preparation" "Fermented papaya extracts".

Results: Fermented papaya is available from several brands and in different dosage forms. Its nutritional composition differs between brands not only in the dose of fermented

papaya but also in the presence of other constituents. Many products are available in the online market, making it difficult to choose a suitable supplement because little is known about their labeling and contents to evaluate their appropriateness. Even if the "fermented papaya" composition is included on labels, this does not guarantee that the products have the same fermented papaya composition related to scientific studies with one specific brand (Immun'Âge-FPP®). Consumers may often interpret anything stated on the label to be authentic merely because it is in print.

Conclusions: There are already many commercial fermented papaya formulations available on the market. However, a deep investigation based on its pharmacokinetic properties is mandatory, as is more regulation.

3.3. The Sensory Attributes of Banana Leaf-Wrapped Smoke Meat: A Comprehensive Sensory Test

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Smoking leads to the penetration of carcinogenic components like polycyclic aromatic hydrocarbons (PAH) into meat. Among the methods of eliminating PAH components, filtration is of significant importance and is utilized in sausage casings or special filtration systems. However, filtration is not used during the smoking process in restaurants. The latest research reported that the use of banana leaves as a coating material did reduce PAH levels, but the effect of the coating process on the sensory characteristics of smoked meat is still not well documented. The present study aims to investigate the effect of using banana leaves as a coating material on the sensory characteristics of beef *longissimus dorsi* during the smoking process. Twelve trained panelists were instructed to evaluate the appearance, color, taste, texture, odor, smoke flavor, and overall acceptability of coated and noncoated smoked meat using a nine-point hedonic scale. In addition to this test, the triangle test—a discrimination test—was applied to 100 panelists, students and academics from the Department of Gastronomy and Culinary Arts. No significant differences in sensory characteristics were detected between the control and coated groups. Smoked flavor scores were 6.5 and 5.7 in the control and coated groups, respectively ($p > 0.05$). Triangle test scores were interpreted according to the chart in TS 5915 (1988) [1], based on which there must be at least 42 correct answers among 100 panelists to declare 95% probability; however, only 40 correct answers were obtained. Banana leaves are currently used as a packaging material or for decorative purposes in East Asia, but their widespread use as coating, filtering, and cooking materials in professional kitchens may provide environmental and economic benefits.

3.4. A Comparative Analysis of the Lipid Composition of Fish Oil Capsules Purchased in Hungary and Turkey

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Objective: The commercial availability of fish oil supplements rich in n-3 long-chain polyunsaturated fatty acids (n-3 LCPUFAs) has increased significantly in recent years. A recent study showed that n-3 LCPUFAs are more effectively absorbed in the form of triacylglycerol (TG) than ethyl ester (EE). However, there is a paucity of data on the specific forms of n-3 LCPUFAs in these supplements. Therefore, our aim was to investigate the main lipid classes (EE and/or TG) of fish oil supplements available in Hungary and Turkey.

Method: The lipid composition of randomly selected, commercially available fish oil-containing dietary supplement capsules from Hungary (n = 36) and Turkey (n = 30) was analyzed by high-performance thin-layer chromatography. The supplements were divided into two subgroups: pure fish oil capsules (fish oil only) and mixed oil supplements (fish oil + other oils).

Results: In Hungarian capsules, 13 products contained predominantly TG, 15 contained EE, and 8 contained both TG and EE fractions. A number of samples were found to contain a variety of additional lipid fractions. Twelve pure fish oil capsules contained only TG, fourteen samples contained only EE, and one contained both TG and EE. In Turkish samples, some capsules contained plant-based oils, such as flaxseed, primrose, and corn oils. According to the label, these mixed-oil capsules had lower levels of EPA and DHA than pure fish oil capsules. Similarly, Hungarian capsules containing plant-based oils, including pumpkin, safflower, and linseed oils, had lower levels of EPA and DHA than those containing pure fish oil.

Conclusions: Hungarian fish oil supplements contain higher levels of EE than reported in previous studies. Therefore, the composition and concentration of these supplements should also be considered when selecting fish oil supplements to ensure their efficacy and associated health benefits. Preliminary studies may also be useful to select the fish oil capsule before starting supplementation trials or advising patients.

3.5. A Holistic Approach: Incorporating Sustainability into Our Diet by Following the EAT-Lancet Dietary Recommendations

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The food we consume, production methods, and waste have significant impacts on human health and environmental sustainability. A diet focusing on plant-based foods and fewer animal-based foods is beneficial for both people and the planet. Agriculture occupies 40% of global land, contributing to 30% of greenhouse gas emissions and 70% of freshwater use. Animal-based foods, particularly red meat, have high environmental footprints. Malnutrition is a major issue with over 820 million people experiencing hunger daily and 150 million children suffering from long-term hunger. Over 2 billion adults are overweight and obese, and diet-related diseases are leading causes of global deaths. The EAT-Lancet dietary guidelines, published in 2019, present a global planetary health diet that is healthy for both people and planet. The EAT-Lancet Commission recommends a plant-based diet, reducing animal products, promoting healthy fats, focusing on whole grains and fiber-rich carbohydrates, diversifying protein sources, promoting portion control, and promoting environmental sustainability. Shifting from unhealthy diets to this diet could prevent 11 million premature adult deaths annually and drive a sustainable global food system by 2050. These guidelines promote human health and environmental sustainability, aiming to transform the global food system to sustainably feed a growing population while preserving the planet. Appropriate policy actions from stakeholders for making healthy sustainable diets and micronutrient-rich foods available and affordable to all with a particular focus on the poor and rural populations should be considered.

3.6. A Sustainable, Extruded Legume-Based Protein Source: Antioxidant, Antinutrient, and Structural Profile

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The challenges of the expanding global population have necessitated the exploration of plant-based protein sources to minimize animal product consumption. Pulses and legumes may be worth investigating.

However, legumes have comparatively low amounts of sulfur-containing essential amino acids and higher levels of antinutrients; they are also difficult to cook and have low digestibility. The goal of this study was to manufacture essential amino acids in balanced legumes through extrusion. Thus, several types of broken legumes and lentils (by-products of the milling process) were collected and pulverized. Powdered legumes and lentils were combined with a plant-based protein isolate.

Four combinations containing chickpeas/lentils/mung beans/protein isolate at different ratios (A—42:20:34:4, B—35:30:31:4; C—45:27:25:3; D—37:25:35:3) were formulated using MATLAB's linear programming. The mixture was extruded using a twin screw extruder at die temperature (100 to 115 °C) with a screw speed of 100–200 rpm at a constant feed rate of 12 rpm and a feed moisture of 22%. The extrudate was passed through a specifically designed die. Antioxidant activity was calculated by TPC, total flavonoid content (TFC), ABTS, FRAP, and DPPH. The antinutrient percentage was analyzed by the percentage reduction in antinutrients, and structural qualities were studied by scanning electron microscopy (SEM) and X-ray diffraction (XRD).

The extrusion procedure lowered antinutritional factors by 77.2 to 93.6%. Higher temperatures resulted in a considerable reduction in antioxidant capacity. However, a low temperature and high rpm retained substantial ($p < 0.5$) TPC and TFC. The interior structure revealed the formation of extensive air cells. An open cell structure and a thinner cell wall at lower temperatures showed high expansion. This might be attributed to the quicker cooking time of lentils (9 to 15 min). XRD revealed that the extrusion cooking transformed the disordered protein structure and crystalline starch structure to an amorphous one, indicating a continuous gelatinized starch phase. Formulation C, with a higher amount of chickpeas, showed greater expansion and retained maximum antioxidants.

3.7. Addition of Mixed Green Banana Pulp and Peel Flours Increases the Resistant Starch Content of Lemon Zest Biscuits

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With the growing demand for healthy and sustainable foods, it is likely that we will see an increase in the use of alternative ingredients that are rich in dietary fiber and antioxidants. In this context, unconventional flours such as mixed unripe banana pulp and peel flours emerge as potential food ingredients. In addition to their technological properties, these flours are notable for their functional compounds, especially resistant starch, other dietary fibers, and phenolic compounds. This study aimed to evaluate the effect of adding mixed green banana pulp and peel flours in the ratio of 90:10 (M1) and 80:20 (M2) (pulp:peel flours), on the resistant starch concentration of lemon zest biscuits. Four different formulations were developed—FC (control, 100% corn starch), F100PF (50% green banana pulp flour), FM1 (50% of M1), and FM2 (50% of M2). The technological parameters (e.g., water activity, color, and firmness) and resistant starch content of the biscuits was evaluated. The F100PF, FM1, and FM2 formulations showed a significant increase in hardness, ranging from 5.79 N (F100PF) to 9.81 N (FM2). Additionally, the addition of the unripe banana flour in the F100PF, FM1, and FM2 formulations significantly reduced the luminosity parameters (L*), while it increased the water activity in the FM1 (0.60) formulation. It was also observed that the resistant starch content was nearly five times higher in F100PF (5.86%), FM1 (5.72%), and FM2 (4.25%) compared to the control formulation (0.98%). These results suggest that mixed green banana flour can be an excellent alternative for producing biscuits that are rich in dietary fiber, contributing to a more balanced and functional diet.

3.8. An Evaluation of the Effect of the Incorporation of Nostoc Commune (Cushuro) on the Nutritional Value of a Compote for the Elderly

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Introduction: Malnutrition in older adults in Peru increases their risk of anemia and osteoporosis. To address this challenge, we proposed including ingredients that provide essential nutrients in preparations intended for this age group. *Nostoc commune* (Cushuro) is a nutritious food that grows at an altitude of 3000 m above sea level, and its consumption promotes local production and sustainability. Additionally, its polysaccharide content provides a gelling effect. In this context, the effect of incorporating Cushuro on the nutritional value of a compote for older adults was evaluated.

Methodology: Two formulations of quinoa, mango, and passion fruit compote were prepared with the same proportion of ingredients except for their Cushuro content: Formulation 1 (with Cushuro) and Formulation 2 (without Cushuro). A proximal analysis and calcium and iron evaluations were performed using validated methods.

Results: The micronutrient results were obtained from a 250 g sample of compote. Formulation 1 contained 136.7 kcal, of which protein represented 1.34%, carbohydrates 11.8%, and fats 0.09% with 41.2 mg of iron and 567.1 mg of calcium. Formulation 2 contained 153.4 kcal, of which protein represented 4.56%, carbohydrates 9.92%, and fats 0.14% with 30.7 mg of iron and 391.1 mg of calcium. Both formulations reached the calcium and iron requirements for older adults that correspond to a snack (10% of the total caloric value). Additionally, Formulation 1 was classified as high in calcium and iron according to the Codex guidelines on nutritional labeling.

Conclusions: The inclusion of *Nostoc commune* (Cushuro) in compotes offers nutritional benefits. There were higher levels of calcium and iron in Formulation 1, reaching the 10% recommended for older adults.

3.9. Apple Fermentation: Valorization of Surpluses from the Fruit Industry

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Introduction: Fermentation is an anaerobic process in which sugars are converted into alcohol by bacterial enzymes or into lactic acid by yeasts. Apple is rich in vitamins and phytochemicals, mainly flavonoids, and it is responsible for antioxidant action. Apples that are unsuitable for fresh use or of inappropriate commercial size are not valued in the market, as they often do not have the physical characteristics the consumer appreciates and are therefore rejected. Furthermore, in industries and fruit processing, high amounts of waste are generated.

Objectives: Study possibilities for valorizing apple waste through fermentation, combining the circular and sustainable economy concepts.

Methods: Local producers, processing industries, and commercial areas were contacted to establish collaborations and test different apple fermentation conditions, varying the part of the fruit used. Flasks with apple and water were placed in the oven at 30 °C, samples were collected every 24 h, and the pH was measured. The fermented products were analyzed to evaluate their antimicrobial activity, measuring the inhibition halo for *Escherichia coli*, *Staphylococcus aureus*, *Bacillus cereus*, *Pseudomonas aeruginosa*, *Staphylococcus epidermidis*, and *Candida albicans*.

Results: The most promising was the test with only apple pulp, since it was under these conditions that a greater inhibition halo was recorded compared to tests with combinations of pulp, peel, seed, and stem. Fermented apple pulp demonstrated greater activity in the sensitivity test for *Staphylococcus aureus*, *Bacillus cereus*, *Pseudomonas aeruginosa*, and *Staphylococcus epidermidis*.

Conclusions: Fermented apple appears to have antimicrobial activity against several species. It is necessary to repeat the tests and analyze the intermediate fermentation times. It would be interesting to vary the state of division of the fruit as well as to carry out biostimulation tests and bioinoculation. As a future project, in addition to analyzing antimicrobial activity, it is intended to identify fermented products, using UV/VIS spectrophotometry and HPLC.

3.10. Brown Rice Bran Powder, When Added to the Standard Diet, Could Alleviate Cardiometabolic Risk Factors and Antioxidant Status in Patients with Metabolic Syndrome

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Introduction: Due to its beneficial contents including dietary fiber and γ-oryzanol, brown rice bran powder (BRBP) can be considered as a functional food item. Hence, the current trial aims to investigate the effects of BRBP consumption on cardiometabolic risk factors, antioxidant status, and gastrointestinal symptoms in adults diagnosed with metabolic syndrome (MetSyn).

Subjects, Materials and Methods: In this 8-week open label, controlled trial, fifty patients with MetSyn were randomized into a control (who only received the standard diet (SDiet)) or intervention group (who were additionally administered 15 g/day BRBP). Patients' demographic and anthropometric data were recorded. Blood samples were then gathered to analyze levels of metabolic factors and antioxidant enzymes activity. Moreover, the Gastrointestinal Symptom Rating Scale (GSRS) questionnaire was completed.

Results: Analysis of covariance (ANCOVA) controlled for the baseline levels revealed that at the study endpoint, compared to the controls who only followed an SDiet, patients who additionally received BRBP showed significant reductions in body mass index (BMI) and (p-value 0.0001; effect size (ES): −1.29), waist circumference (p-value 0.001; ES: −1.12), total cholesterol (p-value = 0.046; ES: −0.66), low-density lipoprotein cholesterol (p-value = 0.037; ES: −0.67), and fasting blood sugar (p-value = 0.015; ES: −0.79). Further, BRBP consumption resulted in significant improvements in high-density lipoprotein cholesterol (p-value = 0.050; ES: 0.62), serum activities of catalase (p-value = 0.026; ES: 0.72), glutathione peroxidase (p-value 0.001; ES: 1.08), and superoxide dismutase (p-value = 0.009; ES: 0.84), as well as constipation rate (p-value = 0.018; ES: −0.85) compared to SDiet alone. However, no significant changes were found regarding levels of triglyceride, glutathione, and blood pressure after the trial.

Conclusions: The findings of this trial support the weight-reducing, hypocholestrolemic, anti-hyperglycemic, and antioxidative effects of adding BRBP to SDiet prescribing for MetSyn patients.

3.11. Development of Herbal Tea Formulations from Citrus microcarpa (Calamansi), Mangifera indica (Mango), and Zingiber officinale (Ginger) Peels and the Evaluation of the Antioxidant and Sensory Profiles of Their Infusions

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The increasing demand for sustainable, locally sourced ingredients in the food industry necessitates exploring the applications of food by-products. This study investigated the use of local food by-products to produce herbal tea, evaluating their potential health benefits and sensory properties. Four new tea formulations (F1, F2, F3, and F4) were developed using *Citrus microcarpa* (calamansi), *Mangifera indica* (mango), and *Zingiber officinale* (ginger) peels in different ratios. The tea formulations were infused at 100 °C for 7 min. Their total phenolic content (TPC), total flavonoid content (TFC), antioxidant activity, and sensory profile were investigated. Of the formulations, F1, consisting of a 1:1 ratio of mango and calamansi peels, emerged as the preferred choice among the panelists. It exhibited the highest TPC (77.30 μg GAE/mL) and TFC (83.53 μg QE/mL), along with a strong antioxidant capacity (EC_{50} 98.66 μg/mL), as determined by the DPPH radical scavenging assay. Notably, both F3, which consisted of a 1:1 ratio of ginger and mango peels, and F4 with a 1:1:1 ratio of mango, ginger, and calamansi peels, although less preferred by the panelists compared to F1, also demonstrated strong antioxidant activities (EC_{50} 71.76 μg/mL and 94.08 μg/mL, respectively). These findings highlight the potential of utilizing these fruit peels in herbal tea production, considering their appealing sensory profiles and significant health benefits. Further research on the promising F1 formulation is recommended, including microbiological tests, shelf-life studies, and additional bioactivity tests. Investigating other combinations and infusion methods may yield formulations with enhanced properties.

3.12. Dietary β-Hydroxybutyric Acid Alters Rumen Microbiome and Nutrient Metabolism in the Rumen Epithelium of Pre-Weaned Goats

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Introduction: The role of β-hydroxybutyric acid (BHBA) includes providing energy, regulating signaling pathways, and ameliorating the gut microbiota in the host, while its nutrient mechanism to improve rumen epithelium development in young ruminants is still unclear.

Methods: In this study, a joint analysis of multi-omics, including rumen microbiota, rumen epithelial transcriptome and rumen epithelial metabolomics in a pre-weaned goat model, was performed to systematically investigate the effect of dietary BHBA on rumen development.

Results: We found that dietary BHBA increased the weight of metabolic organs (rumen and liver) and promoted the growth of rumen epithelium development (p 0.05). The concentration of BHBA and α-amylase (α-AMY) was also increased, while that of lipopolysaccharide (LPS) was decreased (p 0.05). The abundance of several beneficial bacteria was increased (*Fibrobacter*, *Succinivibrio*, *Clostridiales*, etc.). The rumen epithelium transcriptome and metabolomics indicated that BHBA supplementation showed a remarkable effect on the nutrient metabolism of the rumen epithelium. Specifically, the pathways of "fatty acid metabolism", "cholesterol homeostasis", "reactive oxygen species (ROS) pathway" and "peroxisome" were activated in response to BHBA addition. Moreover, the genes

(*HMGCS2*, *ECSH1*, *ACAA2*, *ECH1*, *ACADS* etc.) and metabolites (succinic acid, alpha-ketoisovaleric acid, etc.) involved in these pathways were also regulated positively. The rumen epithelium obtained the energy necessary for its development from the process of volatile fatty acids (VFAs) decomposition. Finally, we observed the close correlations among the phenotypes, ruminal microbiota, host genes and epithelial metabolites, suggesting the mechanism of BHBA promotion in the rumen development.

Conclusions: Overall, our results revealed the beneficial effects of dietary BHBA on the rumen microbiota, host transcriptome and metabolomics and validated the roles of BHBA in regulating the development of rumen epithelium, which could provide new evidence for the potential positive effects of dietary BHBA on the rumen development of young ruminants.

3.13. Edible Insects as a New Culinary Trend in Gastronomy: Attitudes of Gastronomy and Culinary Arts Students Toward Edible Insects

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Scientists predict that rapid increases in the world population will lead to difficulty accessing nutrients for humans in the future. Based on this foresight, finding alternative food sources, such as edible insects, has become an important research subject. Compared with farm animals and poultry, insects' positive contributions to the environment have made them an alternative for sustainable nutrition. Despite its increasing popularity and its recognition as a nutritious and sustainable food source, the consumption of edible insects is still an unusual concept for many people.

This study examines the attitudes of gastronomy and culinary arts students toward edible insects as an alternative nutrient source. The study sample consisted of 33 participants, 63.6% (n = 21) female and 36.4% (n = 12) male students with an average age of 23.09.

Three bar recipes were developed for this study. All bars contained mashed dates, crushed raw almonds, and raw almond flour. Aside from these common ingredients, the first bar contained chocolate-flavored protein powder and oat flour, the second bar contained *locusta migratoria*-type cricket in a powdered form, and the third bar contained *locusta migratoria* both in a powdered form and as the whole insect. All bar ingredients were mixed separately and shaped into bars. All ingredients, including the insects, were suitable for immediate consumption; therefore, heat treatment was not applied.

A face-to-face interview technique was applied for the taste test. While 17 participants consumed the bars with insects, 16 did not, and the reasons they gave were that they found insects disgusting, unhealthy, and against their religious beliefs and cultural values. It was concluded that if gastronomy and culinary arts students were educated about the environmental benefits of edible insect consumption, their nutritious values, and the hygienic conditions in which these insects are bred and processed, the consumption of insects may increase in the future.

3.14. Effect of Mixed Green Banana Pulp and Peel Flour on Physicochemical and Sensory Properties and Resistant Starch Content of Chocolate Cookies

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Mixed green banana pulp and peel flour (BPPF) is a potential ingredient to be used in the development of healthy foods, since green banana pulp flour is rich in resistant starch and the peel flour has high concentrations of antioxidants, minerals, and other dietary fibers. The objective of this study was to characterize chocolate cookies containing BPPF (at the ratio of 80:20 pulp–peel). Four formulations were developed with different levels of BPPF in the substitution of refined wheat flour (F0: 0%, F1: 23.3%, F2: 46.7%,

and F3: 70%). Physicochemical properties and resistant starch (RS) content were determined, and a sensory evaluation was performed through a focus group. The results were submitted to ANOVA and to Tukey's test (p 0.05). There were no differences in the specific volume (1.03–1.24 mL/g), moisture content (13.11–13.92%), and color (based on delta E values) among treatments. Significant differences were observed in RS content among the four formulations, where F3 had the highest concentration (4.93%), which was about seven times higher compared to the control (0.74%). The RS contents of F1 and F2 were 3.55% and 4.55%, respectively. The addition of BPPF affected the texture of the cookies. The control (F0) had the lowest hardness value (4.47 N), whereas F3 had the highest (7.10 N). There was no significant difference in hardness between F1 (5.73 N) and F2 (5.93 N). Regarding sensory properties, F1 had the highest overall acceptance, which was followed by F0. Color and aroma attributes had the highest scores, while crunchiness was suggested to be improved. Thus, the addition of BPPF showed potential to improve the nutritional value of chocolate cookies, suggesting it to be an effective alternative flour to increase RS content in foods.

3.15. Foods for the Sexes: Differential Digestibility of Milk and Plant-Based Drinks and Proteins in Healthy Men or Women

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Aim: Nutrition research is increasingly challenged to elucidate how consumer sex may affect the digestive fate of foods, particularly in an era of booming food innovations such as plant-based milk alternatives. This research explores how consumer biological sex affects the protein digestion of cow's milk (CM) compared to an oat milk alternative (OM) and concomitant protein isolates (i.e., isolated dairy proteins or oat proteins).

Methods: This study utilized a recently developed in vitro digestion model that simulates digestion in males or females. Various drinks and protein isolate suspensions were digested, and digestive effluents were analyzed using SDS-PAGE as well as dynamic and static light-scattering techniques.

Results: The study revealed notable differences in protein digestive trajectories between CM and OM as well as between males and females. In CM digestion, caseins broke down efficiently in both sexes, while β-lactoglobulin showed higher persistence in females. On the contrary, OM proteins displayed greater persistence in males, suggesting less efficient digestion compared to CM. Zeta potential analysis highlighted CM's superior stability (-29 vs. -21–23 mV for OM), which could account for the observed digestive breakdown trajectories, but without explaining the noteworthy differences in the digestive proteolysis of the products between males and females. Interestingly, in males, CM gastric digestion exhibited greater stability compared to females (10 vs. 4.9 mV), indicating less interference with protein breakdown. Conversely, females demonstrated higher stability in OM digestion during the gastric phase, which is consistent with SDS-PAGE findings. Both CM and OM showed instability in the intestinal tract, suggesting potential aggregation and increased particle size, as supported by SLS data.

Conclusions: This study emphasizes that sex-based differences in protein digestion may be an important consideration in the design of future foods. Notably, the findings herein suggest the potentially easier digestion of plant-based proteins from OM compared to CM, especially in females.

3.16. Functional Foods Based on Medicinal Plants of the Family Lamiaceae: A Patent Analysis Overview

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Medicinal plants from the *Lamiaceae* family offer significant potential as functional foods, providing both essential dietary fiber and numerous health benefits. These plants are rich in bioactive compounds such as phenolic acids, flavonoids, and alkaloids, which contribute to their antioxidant and anti-inflammatory properties. Studies on *Lamiaceae* seeds have revealed substantial levels of starch and fiber, suggesting their potential as alternatives to cereals in food applications. The phenolic-rich extracts of *Lamiaceae* species have demonstrated anti-hemolytic and anti-mutagenic potentials, making them suitable for functional food and nutraceutical formulations. By incorporating *Lamiaceae* plants into functional foods, consumers can benefit from a combination of dietary fiber and therapeutic compounds. This synergy may lead to improved digestion, enhanced cardiovascular health, and reduced inflammation. The antioxidant properties of these plants help combat oxidative stress, while their anti-inflammatory effects contribute to overall well-being. As functional food ingredients, Lamiaceae-based products could serve as practical and effective additions to a balanced diet, potentially reducing the risk of chronic diseases and promoting overall health. In this study, we present an overview of functional foods derived from medicinal plants of the family Lamiaceae. By utilizing dietary fiber as a functional component and employing the cooperative patent classification system, we conducted a comprehensive patent analysis to identify trends and innovations in this field. Findings indicate that the major inventions related to Lamiaceae-based functional foods can be categorized into three primary areas. Patents focus on developing food products with *Lamiaceae* plants to enhance nutrition, creating medicinal preparations with plant extracts for health benefits, and improving the nutritive qualities of foods by increasing fiber content and fortifying them with essential nutrients. Overall, this study reveals a strong interest in leveraging the properties of *Lamiaceae* plants to develop innovative food and medicinal products, supporting health and nutrition while meeting the growing demand for natural ingredients.

3.17. Grape Juice Pulp and Its Potential to Attenuate Dextran Sodium Sulfate-Induced Inflammation in Ovo (Gallus gallus)

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Upcycling, or reincorporating waste into consumer goods, has become a spearhead for food sustainability. In addition to reducing waste, studies propose a nutritional benefit of consuming upcycled materials like grape by-products. Grape skins and pulp contain phenolic compounds strongly associated with anti-inflammatory effects. However, grape by-products have rarely been challenged in an inflamed in vivo system. Thus, this study assessed grape juice pulp and its impact on induced intestinal inflammation in vivo. We used the intra-amniotic administration (in ovo) model, which harnesses the broiler (*Gallus gallus*) embryo and its innate consumption of its amniotic fluid on day 17 of incubation. We took a novel double-injection approach where inflammation was induced by first injecting 0.75% dextran sodium sulfate (DSS) followed by a second injection of a 3% grape juice pulp extract (GJPE). Treatment groups were randomly assigned and adequately controlled (n = 102 divided into six groups). To confirm the induction of inflammation and to assess gut health, we measured intestinal permeability via fluorescein isothiocyanate dextran (FITC-d) in the serum, duodenal claudin-1 and occludin expression via RT-qPCR, and duodenal morphology via histology. The FITC-d analysis revealed an ameliorative effect of GJPE on DSS-induced gut permeability. This was further supported by significant decreases in claudin-1 and occludin expression (p 0.05), suggesting that tight junction function was protected by GJPE. Finally, the histological analysis demonstrated significantly greater villus surface area, goblet cell size, and crypt depth (p 0.05) for inflamed groups receiving GJPE compared to the inflamed control. These results re-emphasize grape juice pulp's potential to attenuate intestinal inflammation. Future long-term feeding trials are needed to confirm an anti-inflammatory effect of grape by-products in the context of a full

diet. Nevertheless, this study provides an important step toward upcycling grape waste streams for nutritional benefit.

3.18. Impact of Varied Whey Substrates on the Lactose Oxidation Efficiency of Pseudomonas taetrolens

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Pseudomonas taetrolens is a Gram-negative bacterium renowned for its diverse metabolic capabilities, making it a significant subject of study in biotechnological and industrial processes. Research on *Pseudomonas taetrolens* often aims to optimize conditions for the production of valuable biochemicals, elucidate its metabolic pathways, and explore its potential in industrial applications. This bacterium is particularly noteworthy for its roles in biotransformation and bioremediation, which are crucial in both environmental microbiology and industrial biotechnology. This study investigated the ability of *Pseudomonas taetrolens* to convert lactose into lactobionic acid using sweet and acid whey as substrates. The experimental setup involved controlling parameters such as temperature, pH, agitation speed, oxygen supply, and the viability and quantity of added bacterial biomass. The process was conducted in a bioreactor with data collection every three hours and efficiency tested using high-performance liquid chromatography (HPLC). The results indicated that under identical fermentation parameters, lactose was completely converted into lactobionic acid in sweet whey. In contrast, acid whey required repeated additions of *Pseudomonas taetrolens* biomass to achieve complete lactose conversion. These findings suggest that sweet whey is more suitable for lactose oxidation. However, further tests are necessary to conduct an in-depth analysis of the compositions of sweet and acid whey and their effects on the reproduction of *Pseudomonas taetrolens*.

3.19. Inadequacies of Iron Dietary Intake of Normal- and Overweight Young University Students from Leicester, England

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The dietary intake of iron (Fe) was assessed in young adults at De Montfort University (DMU, UK). Comprehensive nutrient intake was collected from 111 (20.45 yrs old; 78 female) DMU students between 2015 and 2016 from three major ethnic backgrounds (41 Asia, 41 Africa, 27 Europe), using a validated variant of the Nutrition Norfolk Food Frequency Questionnaire. According to their BMI values, 25.7% and 8.3% of this population were overweight and obese; meanwhile, 9.2% were underweight. The overweight status is three times that of the national average in this age group, 10.6%. The dietary intake of Fe was significantly higher in male participants (17.700 vs. 13.634 mg/day; p-value = 0.0023), which could be attributed to the significantly higher intake of foods rich in bioavailable iron, specifically meat (271.553 vs. 193.063 g/day; p-value = 0.016), in males. Moreover, the dietary intakes of Fe did not show statistical differences according to BMI [underweight (11.684) obese (12.953) overweight (15.276) normal weight (15.405), p-value = 0.546] or ethnic background [African (13.888) European (14.724) Asian (15.837), p-value = 0.249; all in mg/day], which might be attributed to the low/different number of responses. However, the results would be logical as they reflect higher dietary intakes of this essential mineral in those groups with healthy food intake and would be related to the increased

consumption of high-energy foods with low-micronutrient content. The dietary intakes of Fe recorded were higher than the reference nutrient intake (RNI) established for male (8.7, range = 6.257–43.809) and female (14.7, range = 4.748–40.693; all in mg/day) populations in the UK for most of the participants. Suboptimal iron status is associated with anemia and physical weakness, work capacity, and tolerance, which could have a negative impact in academic performance that should be tackled by implementing public health strategies and interventions to enhance body Fe status in university students.

3.20. Machine Learning and the Taxonomy of Silene L. Species

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Research on the morphological properties of plant seeds is important because it advances the taxonomy of the genus, contributing to a better understanding of diversity and its evolutionary relationships. *Silene* L. is a genus of plants belonging to the family Caryophyllaceae Juss. Some *Silene* L. species have been considered an interesting source of nutraceutical compounds due to their medicinal properties, including anticancer, antioxidant, antibacterial, and anti-inflammatory effects. Recognizing taxonomic groups based on seed morphology contributes to a better understanding of the diversity and identification of these species. *Silene* L. seeds from 95 populations belonging to 52 species reported in the literature were analyzed using machine learning algorithms such as random forest (RF), support vector machine (SVM), and artificial neural network (ANN) to evaluate their effectiveness in species identification and classification. The results obtained in this research study proved that the machine learning models were effective in identifying the taxonomy of these species. Therefore, the selected machine learning models developed in this study can be a useful tool to classify the taxonomy of these plants through seeds. Nevertheless, there is a considerable gap in the literature on this topic, so further research is necessary to develop new methods for enhancing the accuracy and efficiency of these classification systems.

3.21. Nutritional Composition of Kimchi Made from Oryza sativa (Rice) and Solanum tuberosum L. (Peruvian Potato)

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Introduction: Kimchi (김치) is a meal belonging to the group of fermented foods which originates from traditional Korean cuisine. Due to its easy preparation and storage, its reach has expanded to different cultures worldwide. Its health benefits are attributed to its antioxidant and anti-inflammatory properties as well as its probiotic and prebiotic content. The objective of the present study was to evaluate the nutritional composition of kimchi made with rice starch (K1) and with Peruvian potato (K2).

Methodology: The two formulations of kimchi were prepared with the same ingredients and fermented in the same conditions. The only difference in ingredients was the por-

tion of starch from rice (K1) and Peruvian potato (K2). Each ingredient was used in a quantity of 15.76 g, contributing to a total final product weight of 1970 g. A nutritional study was conducted, which included the physicochemical characteristics of pH and total acidity.

Results: There were no significant differences (p values > 0.05) in nutritional composition and physicochemical characteristics between samples K1 and K2. The results of the nutritional composition analysis were described for 50 g of the product. Formulation K1 had a content of 25.9 kcal, and the distribution of macronutrients was 5.4% proteins, 12.5% fats, 34% carbohydrates, and 0.34 g raw fiber. The other formulation K2 presented a content of 26.2 kcal, 5.3% proteins, 13.1% fats, 33.6% carbohydrates, and 0.39 g of raw fiber.

Conclusions: The analysis revealed that there are no statistically significant differences in nutritional values between the two formulations (p values > 0.05). Nonetheless, this study contributes to the diversification of kimchi recipes, offering a broader range of options for consumers.

3.22. Nutritional Quality of Dried Maggot Meal in Western Burkina Faso

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Animal protein is the limiting factor in livestock production in Sub-Saharan Africa. The inaccessibility of conventional sources to local producers and their high cost are leading to pronounced protein deficiencies in traditional livestock farms, which are major suppliers of animal products (meat, fish, and eggs) to urban centers. A number of non-conventional sources of protein are being proposed to address this problem, including invertebrate meals, particularly from insect larvae such as houseflies. To assess their potential for animal nutrition, bromatological analyses were carried out on samples of sun-dried housefly larvae packaged for transport at the animal nutrition laboratory of INERA (Institut National de l'Environnement et des Recherches Agricoles) Kamboinsé in Ouagadougou (Burkina Faso). These analyses were carried out in accordance with the analysis methods developed by AFNOR (2000) for animal feed. The parameters determined were dry matter (DM), organic matter (OM), fat (FM), crude protein (CP) and mineral matter (MM) content, crude cellulose (CC), calcium (Ca), and total phosphorus (P). The results showed a DM content of 91.87%, including 78.90% OM. The FM, CP, and CC rates were 3.93%, 48.85%, and 9.16%, respectively. Metabolizable energy was estimated at 2491.42 Kcal/kg DM. The quantities of P and calcium were 2.18 mg/kg DM and 5.96 mg/kg DM. These results indicate appreciable levels of crude protein and trace elements, making maggot meal an excellent source of animal protein. The results suggest that maggot meal can be incorporated into the feed of monogastric animals, including poultry, to improve productivity and reduce production costs.

3.23. Personalized Nutrition—A Trend Gaining Momentum: Hope or Hype?

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The concept of 'personalized' or 'precision' is nowadays very widely used in the medical field since the Precision Medicine Initiative was launched in 2015 in the United States. Another recent trend is the use of individualized data about a person to customize dietary therapies, such as recommendations, materials, and services, to help them achieve better outcomes through individual and genetic-based strategies, which is sometimes referred to as personalized or precision nutrition. Personalized nutrition has progressively become truth due to the advancements in the genomics, transcriptomics, proteomics, microbiome, metabolomics, and data technology. Personalized nutrition can be used for illness treatment by means of specialized nutritional therapies, such as a non-gluten diet for those

with celiac disease and a dairy-free diet for dairy intolerance, or avoiding dietary phenylalanine for phenylketonuria. Further, various studies are being carried out on the application of personalized nutrition for obesity, metabolic syndrome, certain cancers, and type 2 diabetes mellitus. However, the area of personalized nutrition continues to face a number of problems, including a lack of effectively organized research investigations with consistent results, and expensive and advanced technologies for collecting and studying the DNA, gastrointestinal bacteria, and food intake of people in general. Personalized nutrition promises to embrace and harness new technologies and integrate them into dietary interventions, but it is expensive and has less impact on population health, and therefore it requires collective efforts from an ethical and legislative perspective in order to implement it through successful strategies, laws, and population-centered approaches.

3.24. Plant Honey Origin Authentication: Use of Electrochemical Genosensors for Food Safety and Quality Control

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Honey is a natural high-quality food product consumed worldwide due to its diverse nutritional profile and beneficial medical properties. These factors, along with honey's unique sweet taste and odor, make it one of the most popular products for a healthy diet. Nevertheless, food fraud is an increasing problem with various impacts on the economy, health, and in the environment, as honey prices are established based on its botanical origin and nutritional composition. In the European Union, honey is one of the most adulterated products found in the market. The mislabeling of a honey's geographic origin and unethical mixing with low-grade honeys, sugars, and other substances are some of the common fraudulent practices. Hence, it is imperative to develop analytical tools to quickly, cheaply, and successfully identify fraudulent products. In this work, an electrochemical genosensor for the detection of two different plant species, *Calluna vulgaris* (the heather flower) and *Castanea sativa* (the chestnut tree), was developed and optimized. Analyzing public database platforms, a 98 base pair DNA target probe for *Calluna vulgaris* and a 103 base pair DNA target probe for *Castanea sativa* were selected and designed. The developed genosensor resulted from a linear self-assembled monolayer of the DNA capture probe of each respective species immobilized onto screen-printed gold electrodes and mercaptohexanol. To improve the genosensor's selectivity and avoid strong secondary structures, a sandwich format for both DNA target probes was designed using a complementary fluorescein isothiocyanate-labeled DNA signaling probe. Chronoamperometry measurements were performed in a 0.13 to 2.00 nM range for both species. The developed genosensor was able to detect the hybridization reaction between the synthetic strands of each plant. Therefore, electrochemical genosensors offer a promising and cost-effective analytical tool to authenticate the botanical origin of honey, guaranteeing honey safety, quality control, and authenticity for both industries and consumers and showing potential for application in combating fraud.

3.25. Promoting Sustainable Plant-Based Nutrition Through Microbial Priming: Impact on Almond Seed Germination and Growth

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Microbial priming is an innovative agricultural technique that utilizes beneficial microorganisms to enhance both crop productivity and nutritional quality, thereby supporting sustainable and healthy plant-based nutrition. This study explores the application of microbial priming to improve almond seed germination, seedling growth, and overall nutritional content, which is crucial for plant-based diets. Methods: Almond seeds were treated with a microbial solution extracted from the rhizosphere of *Pistacia lentiscus* soil to enhance their growth potential. This study investigated their germination rates and seedling growth parameters and conducted comprehensive analyses of soil physicochemical properties and microbial communities. Additionally, the colonization of Arbuscular Mycorrhizal Fungi (AMF), chlorophyll levels, and the content of total sugars and proteins were investigated. Results: Microbial priming led to significantly higher germination rates and enhanced seedling growth compared to untreated controls. Soil analysis showed increased nutrient availability and a greater abundance of beneficial microorganisms. Treated plants exhibited notably higher colonization by AMF, which was associated with elevated levels of chlorophyll, total sugars, and proteins in the seedlings. Conclusions: Microbial priming effectively enhances almond seed germination and seedling growth, promoting higher productivity and improved nutritional quality. This sustainable practice offers an eco-friendly alternative, supporting healthier and more sustainable plant-based food systems. These findings underscore the potential of microbial priming to enhance almond cultivation, promoting plant-based nutrition and sustainability.

3.26. The Potential of Baltic Sea Algae as an Agricultural Resource for the Sustainable Development of the Food Chain

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This study investigates the potential of Baltic Sea algae, in particular *Furcellaria lumbricalis*, as a sustainable agricultural resource to improve the sustainability of the food value chain in Latvia. This research study is in line with Latvia's Smart Specialization Strategy (RIS3), which aims to reconcile economic development with environmental sustainability through the efficient use of natural resources. This study was conducted in two phases: the first involved the collection and analysis of macroalgae samples from various coastal areas in Latvia, while the second focused on controlled experiments to assess the effect of liquid digestate from anaerobically fermented algae on seed germination.

The results indicate that *Furcellaria lumbricalis* has a high dry weight potential and optimal acidity levels for Latvian soils, making it suitable in plant production. Experiments showed that a 12% concentration of liquid digestate significantly accelerated seed germination compared to lower concentrations (3% and 6%). The overall germination rate was highest with the 12% concentration, suggesting that Baltic Sea algae can serve as an effective growth promoter for cultivated plants.

This study concludes that Baltic Sea algae can improve the sustainability of the food value chain by providing a renewable source of nutrients, leading to healthier and more nutritious food options. However, further research is needed to assess the long-term effects of algal liquid by-products on plant growth and green mass. Filling this research gap is crucial to fully realize the potential of algal biomass in sustainable agriculture and to promote a climate-resilient food system.

3.27. The Utilization of Off-Range Vegetables in the Diet of Diabetics—The Development of a New Product with High Prohealthy Qualities

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The variety of food products available for specific consumers, such as diabetics, constantly needs to be improved. It is particularly important to provide them with products of high nutritional quality. When designing and producing such products, it is also worth paying attention to their environmental aspects. At the agricultural production stage, approximately 15% of raw materials are never used immediately after harvesting. The use of such vegetables, which are not suitable for direct consumption according to commercial requirements, is therefore of ecological importance and fits within the zero waste trend.

This study aimed to develop vegetable ball recipes that included an additive with health-promoting importance for diabetics and analyze them. The raw materials used were vegetables supplied directly from a farm, which were of an off-range nature: carrots, broccoli, parsley, cauliflower, red beet, and other minced vegetables in frozen form. Powdered white mulberry leaf extract (100 mg, 200 mg, or 350 mg DNJ) was used as a biologically valuable component for diabetics. Fifteen variants were produced, which were bound together with potato starch (5% additive) and frozen (−23 °C). These methanolic extracts (after sonification) were characterized by nutritional value, color, polyphenol content, and antiradical activity.

The vegetable balls provided energy in the range of 20–30 kcal/100 g and a fiber content of approximately 7%. Their polyphenol content was measured using the Folin reagent, which oscillated at 1.111–3.236 mg GAL/g d.m.; the scavenging activity of $ABTS^{+}$, at a level 11.920–45.168 mM Tx/g d.m.; and scavenging activity against DPPH, at the level 2.182–3.791 mM Tx/g d.m., depending on the formulation. To summarize, this study showed that the proposed usage of off-range vegetables in the formulation of vegetable balls is justified, providing an interesting new product for discerning consumers.

4. Session 3: Diet and Chronic Disease Management

4.1. Evaluation of Salicylate Intake in Pregnant and Non-Pregnant Women

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Many plant foods, especially vegetables, herbs, and spices, contain natural salicylates, which are beneficial to health. Thus, this study aimed to determine the dietary and total salicylate intake of pregnant/non-pregnant women.

In this survey, an equal number of non-pregnant and pregnant women (35 each) aged between 18 and 49 years participated. The pregnant group was within 25–38 weeks of gestation. Participants completed a validated FFQ questionnaire and a 24 h recall nutrition interview. Data were analyzed using an original food database and the Aliant software package (https://aliant.tech/, accessed on 1 November 2024). BMI was also determined. Statistical analysis was performed through the use of Mann–Whitney test and the Spearman correlation coefficient in Statistica 13.3.

Data analysis indicated that the total salicylate intake in pregnant (P) women was higher, at a mean of 1136.09 ± 577.47 μg/day, than that of non-pregnant (NP) women, at 708.63 ± 427.92 μg/day. While none of the non-pregnant (NP) women used supplements containing salicylates or aspirin, 3% of the pregnant women occasionally used aspirin. The most commonly consumed salicylates in the pregnant (P) group were basil, buckwheat, nuts, and pickled cucumbers, along with oregano, whereas in the non-pregnant (NP) group, basil, buckwheat, cauliflower and oregano were most frequently consumed. The analysis of the obtained results indicated a negative association between general BMI and salicylate intake, R = −0.29, while the correlation between BMI and vitamin C intake was positive and equal to R = 0.25. Also, the nutritional survey analysis showed that the mean intake values of total energy, protein, carbohydrates, potassium, calcium, phosphorus, magnesium, iron, zinc, and copper were considerably lower in the pregnant (P) group

than in non-pregnant women (NP). Thus, the diet of pregnant women was found to contain less than the RDA for the majority of the nutrients examined.

In conclusion, the consumption of natural salicylates in pregnancy was rather high, especially in the second stage of pregnancy. However, the overall diet during pregnancy showed a comparatively low density of macro- and micronutrients, potentially affecting fetal development negatively.

4.2. A Comprehensive Nutritional Assessment for Short Bowel Syndrome in a Referral Center

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Background and aim: Short bowel syndrome (SBS) is a rare malabsorptive condition and represents the most common mechanism of intestinal failure. The aim of our study is to comprehensively evaluate the nutritional status (NS) of SBS patients by analyzing a consecutive cohort of seven patients at the Gastroenterology Department, University of Palermo.

Methods: NS was assessed using anthropometric measurements, the handgrip test (HT), and bioimpedance analysis from March 2023 to October 2023.

Results: A total of 43% of the patients were underweight. Based on the modified EWGSOP 2010 criteria, 42% had a phase angle (PA) of 4.45, indicating non-severe sarcopenia. According to the HT and the skeletal muscle index (SMI), 71% were sarcopenic. A total of 72% of the patients received enteral nutrition (EN) and/or parenteral nutrition (PN), while 14% had never undergone nutritional therapy (NT) and another 14% had previously received PN.

All patients needed essential vitamin support; some required additional electrolytes, magnesium, or a glutamine and essential amino acid mixture to support muscle and plasma protein synthesis in protein malnutrition. Immunonutrition was adopted in 57.1% of cases.

Follow-Up: After six months, 60% of patients showed improvement in PA and SMI values as well as in muscle strength. A total of 40% experienced slight weight loss; among these, 50% had worsened PA despite maintaining or increasing SMI and HT values. Weight loss was attributed to non-adherence to nutritional guidelines. Changes in nutritional assessment over time led to adjustments in the dosage and frequency of nutritional bag administration with many patients reducing infusion volumes due to improved intestinal absorptive capacity.

Discussion and Conclusions: An adequate macro- and micronutrient intake is crucial for SBS patients. Inadequate NT can contribute to sarcopenia with malabsorption episodes exacerbating muscle catabolism. The frequent monitoring of electrolytes, use of PN and EN, and fluid balance is essential. Most SBS patients are malnourished and sarcopenic; timely NT and medication can lead to clinical improvement and enhanced intestinal absorption, reducing infusion volume needs.

4.3. Anti-Obesity and Anti-Steatotic Effects of Bixin (Apocarotenoid from Bixa orellana L. Seeds): Dose-Dependent Correlations with Bioactivity

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Introduction: Annatto, a tropical shrub from Central and South America and parts of India, contains bixin, which is an apocarotenoid pigment. Bixin is conventionally used as a natural food colorant and is now gaining attention for its health-promoting nutraceutical properties, particularly in chronic diseases (metabolic syndrome—MetS—and cancers). This study investigates the dose-dependent anti-obesity and anti-steatotic effects of bixin in in vitro cell culture models.

Methods: The anti-adipogenic and anti-steatotic effects of bixin were examined in well-established in vitro models of obesity and non-alcoholic fatty liver disease (NAFLD/

steatosis), using 3T3-L1 preadipocytes (according to a differentiation protocol) and HepG2 cells (steatosis-induced with oleic acid), respectively. Bixin was administered in the concentration range of 1–20 μg/mL (obesity model) and 2.5–10 μg/mL (NAFLD/steatosis model). The neutral lipid content was estimated using Oil Red O staining; ROS/RNS were quantified using 2′,7′-dichlorofluorescein diacetate (DCFDA), nitrite assays, and malondialdehyde (MDA); and the biochemical marker of lipid peroxidation was assessed using the TBARS assay.

Results: At lower concentrations, 5 μg/mL in steatotic cells and 10 μg/mL in matured adipocytes, bixin significantly reduced lipid accumulation in both hepatocytes and adipocytes (p 0.05), demonstrating its potential as an anti-steatotic and anti-obesity agent. This beneficial effect was correlated with a reduction in oxidative stress levels (decreased MDA and ROS/RNS levels). Strikingly, bixin at higher concentrations (>10 μg/mL) showed increased lipid accumulation and oxidative stress.

Conclusions: Bixin exhibits anti-obesity and anti-steatotic effects at lower doses, which correlates with its antioxidant properties. However, its bioactivity is dose-dependent, wherein at higher concentrations, it ceases to inhibit adipogenesis. This opposing response is accompanied by elevated oxidative stress levels, indicating a pro-oxidant effect at higher doses, which implicates its anticancer potential. The present study highlights the significance of dosage optimization of nutraceuticals and dietary ingredients with respect to their intended biological applications, such as MetS and cancer treatment.

4.4. Warfarin–Supplement Interactions: A Systematic Review

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Introduction: Food supplements, which are concentrated forms of nutrients, play a crucial role in maintaining a balanced diet by providing essential missing nutrients. However, their impact on drug interactions cannot be overlooked. One such drug is warfarin, which is an anticoagulant with a complex interplay involving various medications, foods, and supplements. Given the significant increase in the use of dietary supplements in recent years, there is a compelling rationale to investigate their interactions with warfarin. This systematic review aims to identify supplements that interact with warfarin, thereby providing insights into potential risks and implications.

Methodology: In order to address the research question "What potential drug interactions may arise when food supplements are taken concomitantly with warfarin?", a PRISMA 2020 systematic review was conducted. To accomplish a comprehensive understanding of the issue at hand, several databases were consulted. In order to fulfill the search platforms' requirements, the terms "interactions", "warfarin", and "supplements" were combined in multiple ways. The inclusion criteria took into account original, randomized or non-randomized studies and case studies that mention a supplement used concomitantly with warfarin. An artificial intelligence-based tool was used to evaluate the studies' quality. The obtained results were summarized in a table format, detailing the supplement used and the how the interaction occurs.

Results: A search of the literature yielded 968 articles, of which 14 were selected for review. These articles met the specified criteria, namely the use of a dietary supplement concomitantly with warfarin. Of these, 11 indicated a potential interaction, while three articles suggested that no interaction occurred.

Conclusions: This work clarified the interactions between supplements and warfarin, emphasizing supplements such as dong quai, milk thistle, and American ginseng, which alter the mechanism of action of the drug. Furthermore, it is imperative for patients to seek counsel from healthcare professionals before modifying their dietary regimen.

4.5. Correlation of Reduced Serum Iron Levels with Acute Adenoiditis in Preschool-Aged Children

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Adenoid tissues, also known as pharyngeal tonsils, are a mass of lymphatic tissue located in the nasopharynx that play a crucial role in the immune system by trapping and destroying pathogens entering through the nasal passages and is formed by a lymphatic structure with an immunological role, being a part of Waldeyer's ring. The purpose of this study is to evaluate the correlation between low serum iron levels in preschool children who present for otolaryngology evaluation with symptoms of acute adenoiditis.

Materials and Methods: In our study, we included 118 patients aged between 2 and 6 years who presented with nasal obstruction, purulent rhinorrhea, sleep disturbance, nocturnal cough, and varying degrees of fever attacks. Otolaryngological examination evidenced adenoidal tissue of different sizes covered with pus that drained into the nasal fossa and at the level of the posterior pharyngeal wall. Given the multitude of etiological factors implicated in the onset of acute adenoiditis, we aimed to evaluate the serum iron levels in all examined patients.

Results: More than 42% of the investigated patients presented with varying degrees of low iron levels, which were well correlated with the intensity of their symptoms.

Conclusions: Our observational study concludes that deficient nutrients in a healthy diet, associated with low serum iron levels, are correlated with the onset of acute adenoiditis in preschool children.

4.6. Dark Sweet Cherry (DSC) Phenolics Enriched in Anthocyanins Suppressed the Expression of Genes Associated with Metastasis in a Triple-Negative Breast Cancer (TNBC) BALB/c Mouse Syngeneic Model

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DSCs are a source of anthocyanins (ACNs) that have been proven to suppress tumor growth and metastasis in vitro and in vivo. TNBC metastasis is linked to genes associated with cell growth, stemness, hypoxia, and epithelial–mesenchymal transition (EMT), where epithelial cells acquire enhanced motility and invasiveness. This study assessed ACN's role in TNBC tumors from an animal model mimicking stage-IV human BC.

4T1 TNBC cells were implanted into BALB/c mice mammary fat pads. The control group received saline solution by gavage every other day. The ACN group was fed 150 mg of ACN (Cyanidin-3-O-Rutinoside) per kg body weight by gavage every other day. The DOX group received 2 mg/kg body weight (I.P. injection) every 4 days, and the COMB group received both ACN and DOX at the same doses and times. Mice were euthanized when primary tumors reached 2000 mm^3. Tumors were analyzed for mRNA levels of genes associated with invasion and metastasis.

ACN treatment downregulated mRNA levels at 0.15-(CD44), 0.24-(HIF-1a), 0.22-(SNAI1), 0.31-(mTOR), 0.53-(RGC-32), 0.20-(SIRT1), 0.12-(STAT3), 0.14-(TGFb), and 0.18-(Tjp)-fold of control. Moreover, when compared to DOX, ACN downregulated genes linked to aberrant cell growth, EMT, and poor clinical outcomes such as CREB, HIF-1a, PIK3CA, and RGC-32 (0.04-, 0.20-, 0.05-, and 0.52-fold of DOX, respectively). Furthermore, DOX alone failed to suppress RGC-32, but COMB showed a downregulation to 0.4-fold of DOX, suggesting a role of ACNs in enhancing the therapeutic efficacy of DOX.

ACNs effectively downregulated genes pivotal in TNBC metastasis, promoting angiogenesis, EMT, invasion, metabolic reprogramming, and stem cell maintenance. This suggests ACN's potential to improve TNBC patient outcomes in chemoprevention and

combination therapy. Further research is needed to investigate correlations between tumor gene expression and metastasis in harvested organs from this animal model.

4.7. Development and Characterization of Stimuli-Responsive In Situ Honey Gel for Improved Wound Healing Approach

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Introduction: Honey has been proven to be efficacious in wound healing since ancient times. In the modern world, the application of honey has reappeared with a focus on the treatment of diabetic wounds.

Methods: Thus, in the present study, an in situ hydrogel was fabricated through the use of a stimuli-responsive polymer, poloxamer 407, and chitosan. Each polymer was dispersed individually using the cold method. Subsequently, medical-grade honey was incorporated into the in situ hydrogel formulation, where the temperature at the site of application stimulated the conversion of the formulation from a sol form into a gel. An initial characterization of the formulation's spray diameter, gel-to-sol conversion, rheological parameters, and mucoadhesive characteristics has been performed. The antimicrobial activity, antioxidant activity, and in vivo wound-healing efficacy of the formulation were also studied.

Results: The selected in situ formulation demonstrated a phase transition at 33 °C, a pH of 5.8, which is appropriate for use in wounds, and an appropriate viscosity (408 cP) that would allow the hydrogel to be applied easily. However, its strong mucoadhesive force (20.300 ± 0.557 g) would prevent the formulation from leaking after its application. Furthermore, the antibacterial efficacy of the formulation was also found to be satisfactory against both *Escherichia coli* (gram −ve) and *Staphylococcus aureus* (gram +ve). The excision wound model showed that the treatment group exhibited rapid re-epithelization and collagen formation in comparison to the control group and the standard group. The biochemical antioxidant assay showed that there were significant results in the treatment group compared to the control group.

Conclusions: Based on these findings, it could be concluded that using this in situ hydrogel of honey is a better option for treating diabetic wounds.

4.8. Effect of Green Tea Kombucha on Intestinal Microbiota and Serum Metabolome of Individuals with Excess Weight: A Randomized Controlled Trial

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Introduction: Green tea kombucha (GTK) is a fermented tea that emerged as a promising probiotic antioxidant beverage. Nevertheless, no clinical trials have investigated its effect on human intestinal microbiota and serum metabolites. This study aimed to bridge

this gap by examining the influence of GTK on microbiota diversity and composition and serum metabolites of individuals with excess body weight.

Methodology: This is a randomized controlled clinical trial that lasted ten weeks with two parallel groups: the control group (n = 29) under a healthy diet with energy restriction (−500 kcal/day) and the kombucha group (n = 30) with the same diet + GTK (200 mL/day). Fecal and serum samples were collected before and after the intervention. 16S rRNA was used for microbiota analysis. Serum untargeted metabolomics used chromatographic analysis with HPLC coupled to a TOF mass accuracy.

Results: Differential abundance analysis between the two groups showed changes in family, genus, and species levels, but no significance remained after adjusting by Benjamini–Hochberg. When comparing the changes between baseline and endpoint, Chao 1 (genus level) increased only in the kombucha group ($p = 0.027$). Shannon index and beta diversity by Bray–Curtis dissimilarity did not show any changes after the intervention. In relation to metabolomics, 707 features were found as exclusive of the kombucha group in the ESI+ mode and 674 features in the ESI- mode. After the exclusion of drugs/toxins, a total of 17 putative metabolites in ESI+ mode and 18 in ESI– were identified only in the kombucha group. Among them, there were compounds derived from fungi (aspergoterpenin D) involved in the glutathione metabolism pathway (5-L-Glutamyl-L-alanine) and with anti-inflammatory effects (ankaflavin).

Conclusions: GTK did not greatly modify intestinal microbiota composition, but it had a relevant impact on the serum metabolome that could positively improve the metabolic health of individuals with excess body weight.

4.9. Effect of Multi-Strain Probiotic Supplementation on Magnesium and Calcium Metabolism in Obese Postmenopausal Women: A Randomized Trial

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Introduction: Excess body fat disturbs the delicate balance of calcium in the body by influencing parathyroid hormone (PTH) levels and vitamin D metabolism, often leading to lower magnesium levels. Recent research suggests that single-strain probiotics can positively influence gut health and mineral balance in obese individuals. Yet, the potential of multi-strain probiotics in addressing these issues among obese postmenopausal women remains largely unexplored. This study seeks to uncover how multi-strain probiotic supplementation, administered at varying doses, impacts magnesium and calcium metabolism in this specific demographic.

Materials and Methods: Three groups of postmenopausal women with obesity, comprising 30 subjects each, received a nine-strain oral probiotic supplement in a daily dose of 2.5×10^9 colony-forming units (CFUs) in the low-dose (LD) group, 1×10^{10} CFUs in the high-dose (HD) group, or a placebo for 12 weeks. The probiotic mixture contained bacterial strains (*Bifidobacterium bifidum* W23, *B. lactis* W51, *B. lactis* W52, *Lactobacillus acidophilus* W37, *L. brevis* W63, *L. casei* W56, *L. salivarius* W24, *Lactococcus lactis* W19, and *Lc. lactis* W58) in equal parts. The excipient was composed of maize starch and maltodextrins. The placebo group received the excipient alone packed in identical sachets.

Samples were washed in acetone and deionized water, dried at 105–110 °C, and weighed; permed or dyed hair was excluded. The Ca and Mg contents of hair and serum were determined after digestion in 65% spectra pure HNO_3 using a Microwave Digestion system, which was followed by measurement with flame atomic absorption spectrometry. The accuracy of the method was verified using certified reference materials, achieving a 95–98% accuracy for Ca and 99–103% for Mg.

Results: Following the intervention, both supplemented groups exhibited elevated magnesium (Mg) levels in their hair compared to the placebo group. Conversely, hair calcium (Ca) content was higher in the placebo group compared to the low-dose (LD) group post-intervention. The serum Mg concentration was notably higher in the LD group but

lower in the high-dose (HD) group compared to the placebo. Serum Ca concentration in the LD group was lower than that observed in both the placebo and HD groups post-intervention. Additionally, the hair Ca content was significantly reduced compared to the HD group following the intervention.

Conclusions: This study indicates a clear impact of probiotic supplementation on Mg levels, as well as more nuanced effects on Ca levels, which are more complex and dosagedependent.

4.10. Evaluation of the Efficacy of School-Based Deworming Program on the Prevalence of Undernutrition Among School Children in Barangay San Lucas 1, San Pablo City, Laguna

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The present study investigated and evaluated the efficacy of a school-based deworming program on the nutritional status of school children (59–119 months) in Barangay San Lucas 1, San Pablo City, Laguna. Through random sampling, 175 school children participated in the study. Anthropometric measurements were obtained, and participants' primary caregivers were asked to complete a child eating behavior questionnaire (CEBQ). The study revealed that most of the study participants were from low-income households, and that the mother-reported and observed children's desire to drink had the highest attained mean among all the subscales, which was followed by the enjoyment of food. Meanwhile, the subscale that had the lowest mean included emotional overeating and food responsiveness. Before deworming, the prevalence of wasting and underweight were both "very high" (25.71% and 28.0%, respectively), while stunting prevalence was "low" (9.14%). After deworming, there was a significant difference in the proportion of wasting (x2 = 26.1; p 0.001) and stunting (x2 = 29.4; p 0.001). However, there was no significant difference in stunting prevalence before and after deworming (x2 = 0.12; p 0.001). It was concluded that deworming influences wasting (low weight-for-height) and underweight (low weight-for-age) by lowering its prevalence after intervention; for stunting, it was also found that correlations between sociodemographic profile and nutritional status, sociodemographic profile and child eating behavior, child eating behavior and deworming, and deworming and nutritional status were significant at p 0.01. However, there is no sufficient evidence to say that there was a significant difference before and after deworming across all eating behavior subscales.

4.11. Exploring the Osteogenic Potential of Microalgae Methanolic Extracts

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The human population is growing rapidly—it is expected to reach 9 billion by 2050—and people are living for longer periods, which, in association with poor nutrition and sedentarism, has increased the incidence of age-related metabolic diseases such as osteoporosis. Microalgae are a valuable source of bioactive compounds that affect bone formation and mineralization. Methanolic extracts of *Chlorella* sp., *Dunaliella salina* and *Phaeodactylum tricornutum* were screened for osteoactive compounds using a zebrafish operculum assay and a gilthead seabream vertebrae-derived VSa13 cell line. Three concentrations (10, 31.6 and 100 µg/mL) were evaluated for each extract. While no significant effect was observed on opercular bone mineralization for any of the extracts and concentrations used, the extracts prepared from *Chlorella* sp. at all concentrations tested and *D. salina* ex-

tract at the highest concentration decreased the mineralization of the VSa13 extracellular matrix when compared to the control (0.1% DMSO). This anti-mineralogenic effect was associated with a change in cell morphology, suggesting that it may be the consequence of altered cell differentiation. On the other hand, extracts from *P. tricornutum* increased extracellular matrix mineralization by around 4% at all concentrations tested. This pro-mineralogenic effect may be related to the presence of high amounts of polyphenols in methanolic extracts. Polyphenols are secondary metabolites with a wide range of biological activities, in particular with the ability to stimulate bone formation and mineralization, but also osteoblast proliferation and differentiation. Our results suggest that extracts from *P. tricornutum* may represent a promising source of nutrients that can potentially be used for the treatment or prevention of osteoporosis.

4.12. Fabrication of Carbocisteine-Loaded Solid Lipid Nanoparticles for the Treatment of Pulmonary Disease and In Vitro Evaluation

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Solid lipids nanoparticles (SLNs) are an alternative carrier system to polymeric nanoparticles or liposomes. They consist of physiological and biocompatible lipids. It has been claimed that SLNs offer the combined advantages and avoid the disadvantages of other colloidal carrier systems. The aim of this research work is to fabricate and evaluate the carbocisteine-loaded solid lipid nanoparticles. SLNs were prepared by using glycerol monostearate by a high-pressure homogenization method, using poloxamer 188 as a stabilizer to improve drug bioavailability and to reduce particle size. A drug and excipient compatibility study was checked by using FTIR, and it was found that there was no interaction between the drug and excipients. Optimized carbocisteine SLNs were evaluated for zeta potential, particle size, and % drug release, revealing results of −19 mv, 50 to 200 nm, and up to 70.84%, respectively. To check the stability of the formulation, an accelerated stability study was performed, and the results show that the formulation was stable. To evaluate SLNs prepared by the HPH method, all the batches were evaluated for various parameters, and we found good results. The F6 batch was found to be best among all prepared batches, and the same batch was optimized on the basis of particle size, stability, zeta potential, and release pattern. SLNs could provide improved advantages of good penetration and targeting to treat pulmonary disease.

4.13. Formulation and Evaluation of a Probiotic Dragon Fruit (Hylocerus undatus)–Honey Beverage

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Background: Today, all consumers have a considerable amount of their nutritional needs met through fermented foods and beverages. Probiotic foods have positive effects on intestinal microbiota composition and overall health. The use of fruit juices as vehicles for probiotic microorganisms can be an alternative for those who do not or cannot consume dairy products. With an increase in lactose intolerance and vegetarianism and a high demand for vegetarian probiotic products, there is an urgent need to develop new non-dairy probiotic food products. Fruits could be a suitable alternative to serve as a medium for probiotic product development. One such fruit is dragon fruit.

Aim: To formulate and evaluate a probiotic dragon fruit (*Hylocereus undatus*)–honey beverage incorporating the strain Lactobacillus acidophilus.

Methodology: A probiotic and a non-probiotic dragon fruit–honey beverage was prepared by inoculating and fermenting it with the revived *Lactobacillus acidophilus* (NCDC14).

An analysis of specific nutrients of the formulated beverages, such as energy, carbohydrate, protein, vitamin C, and calcium, was carried out. The chemical parameters of the beverages such as pH, titratable acidity, total soluble solids, total sugar, and reducing sugar were also assessed. The total bacterial count of the prepared probiotic and non-probiotic beverages were evaluated after 24 h.

Results: The prepared probiotic and non-probiotic beverages were found to have adequate nutrients such as carbohydrates, proteins, calcium, and vitamin C, and they were also found to have optimal pH, titratable activity, total soluble solids, and reducing sugars. However, the total bacterial count was found to be higher in the probiotic beverage than the non-probiotic beverage.

Conclusions: From the results, it is evident that the formulated probiotic dragon fruit–honey beverage may be expected to be a good substitute for milk for individuals who have lactose intolerance or a milk allergy.

4.14. Fueling Healthy Growth: A Review of Nutrition's Role in Child Development and Chronic Disease

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Obesity and chronic disorders connected to nutrition are on the rise in countries going through nutrition transition. In transitional nations, children's micronutrient deficiencies (zinc, iron, and vitamin A) and stunting (short stature relative to age) combine with obesity and non-rheumatic chronic diseases (NRCDs), creating a double burden of nutritional illness. Obesity and non-restricted childhood diseases (NRCDs) have a complex and multifaceted causation web; dietary and physical activity changes in the population are probably the key concurrent determining factors. Recent research, however, points to certain patterns of fetal and postnatal growth as possible additional factors. Research suggests that rather than focusing on weight gain, intervention measures to avoid malnutrition should prioritize gains in linear growth during the first two to three years of life. It is essential to prevent excessive weight increase in height gain (BMI) after the first two years of life. To prevent obesity and non-communicable diseases (NRCDs) early in life, it is essential to regularly assess children's growth using the new World Health Organization (WHO) standard, to define energy needs using the most recent Food and Agricultural Organization (FAO)/WHO norms, and to provide essential micronutrients to support lean mass growth. By preventing and controlling juvenile obesity, these measures should help avoid NRCDs in upcoming adult generations.

4.15. Higher Alcohol Preference Is Not Necessarily Linked to Higher Consumption of Palatable Food in Rats

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Alcohol use disorder (AUD) is a chronic relapsing disorder afflicting millions of people worldwide. Malnutrition is frequently associated with AUD, and it could be a result of reduced nutritional intake and impairment in the absorption/metabolism of nutrients because of excessive alcohol drinking. Interestingly, a higher consumption of high-calorie/palatable foods is reported in recovering alcoholics who have stayed sober. However, it is unclear if the higher calorie content or rewarding properties of these palatable foods account for a protective effect in these conditions. In the present study, we evaluated the palatable food intake in male and female alcohol-preferring (P-rats) and compared it to alcohol non-preferring rats (NP-rats). Importantly, alcohol-preferring (P-rats) were selectively bred for higher alcohol preference and are a well-characterized model of alcoholism.

A group of P- and NP-rats received a high-fat diet (40% fat) on four separate days over a two-week period, and 24 h caloric intake and changes in body weight were recorded. Unrestricted standard chow and water were available to all groups for the entire study duration. The total caloric intake in both P- and NP-rats was significantly increased on HFD access days compared to chow-only days, which was an effect observed in both males and females. Further analysis revealed that the total caloric intake in P-rats was significantly lower compared to NP-rats, which was an effect that was more significant and pronounced in female rats. Furthermore, the body weight increase during this period was significantly lower in P-rats than in NP-rats, which was an effect that was more significant and pronounced in male rats. These data not only document important sex-based differences and differences in palatable diet intake between alcohol-preferring and non-preferring rats but also highlight that higher alcohol preference does not necessarily equate to a higher intake of high-calorie/palatable food.

4.16. In Silico Investigation of Phyllanthus niruri Phytochemicals as Hepatic Fibrosis Modulators

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Introduction: The liver plays a crucial role in metabolic, detoxification, and endocrine functions. Hepatic wellness imbalances are driven by acute factors like hepatitis and drug allergy as well as chronic ones like non-alcoholic fatty liver disease (NAFLD) and hepatocellular carcinoma (HCC). In NAFLD, steatosis drives hepatic fibrogenesis to augment liver injury cum inflammation. Liver fibrosis is a challenging quest in hepatology in the search for safer and specific therapeutics. This study investigates the hepato-protective effect of *Phyllanthus niruri* compounds against liver fibrosis targets like LOXL2, HSP-47, BRD4, and IKKB, and compares their anti-hepatic fibrosis activity against known inhibitors.

Methodology: Phytochemicals from *P. niruri* were selected from the literature, and potential compounds which satisfy the acceptable thresholds of Mol.wt, Lipinski rule, and bioavailability were explored for in silico virtual screening. Liver fibrosis targets that influence HSC activation (BRD4), collagen stability (LOXL-2 and HSP-47), and fibrotic inflammation (IKKB) with the PDB Ids 6C7Q, 5ZE3, 3ZHA, and 3RZF, respectively, were investigated using Auto dock Vina docking software (https://vina.scripps.edu/, accessed on 1 November 2024) and further analyzed for reliable ADMET parameters.

Results: The virtual screening reveals that compounds like β-sitosterol, cianidanol, ellagic acid, epicatechin gallate, epigallocatechin gallate, hinokinin, methyl brevifolincarboxylate, niruriflavone, phyllnirurin, 4-sinapoyl quinic acid, and quercetin showed more promising interactions with the liver fibrosis targets BRD4, LOXL-2, HSP-47, and IKKβ in comparison to the known inhibitors like CE277, levoleucovorin, HSP47 inhibitor III, and K 252a, respectively. *P. niruri* compounds also qualified for the permissible thresholds of ADMET.

Conclusions: Our in silico results suggest that *Phyllanthus niruri* compounds have the potential to be developed as an effective drug candidate toward the management of hepatic fibrosis.

4.17. Inhibitory Activity of Hericium erinaceus Extracts Against Some Bacterial Triggers of Multiple Sclerosis and Selected Autoimmune Diseases

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Hericium erinaceus (Bull.) Persoon (HE) is a mushroom that is used to treat a variety of medical conditions including Alzheimer's disease (AD), Parkinson's disease (PD) and peripheral nerve injury. However, there is a lack of research into its effects against autoimmune diseases, including multiple sclerosis (MS). This study aims to explore the inhibitory activity of HE extracts against some bacterial triggers of MS and selected autoimmune diseases. Thus, this study aims to be the first to our knowledge to explore the antimicrobial properties of HE extracts on bacteria that have been shown to be the triggers for MS development.

Methods: HE was extracted using methanol, deionized water, ethyl acetate, hexane and chloroform, and these extracts were tested for biological activities. Antimicrobial activity was tested against *Acinetobacter baylyi* and *Pseudomonas aeruginosa*, which are triggers for the development of MS, and *Proteus mirabilis*, *Klebsiella pneumoniae* and *Streptococcus pyogenes*, which are triggers for the development of rheumatoid arthritis, ankylosing spondylitis, and rheumatic fever, using disc diffusion assays, at concentrations of 24.8, 18.5, 4.2, 5.5 and 5.5 mg/mL respectively, and their minimum inhibitory concentrations (MIC) were quantified using liquid micro-dilution assays. The toxicity of the HE extracts was evaluated using the Artemia nauplii lethality assay.

Results: All extracts showed only mild antimicrobial activity except methanol extract against P. mirabilis at 24.8 mg/mL, which showed a 10 mm zone of inhibition. Methanol extracts also showed mild antibacterial activity against *P. aeruginosa* in the micro-dilution assay at 2.3 mg/mL. The assessment of toxicity using the Artemia nauplii lethality assay showed HE to be non-toxic.

Conclusions: This preliminary study of HE against some pathogenic bacteria shows inhibitory potential against some bacterial triggers of MS and lack of toxicity, thus highlighting its potential in the prevention and treatment of these diseases. Further studies will confirm the effects of these extracts against other aspects of MS progression.

4.18. Integrative Approaches in Renal Nutrition: Combining Conventional Dietetics with Ayurveda Nutrition Practices

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The renal diet has historically posed significant challenges in medical nutrition therapy, particularly in its conveyance, comprehension, and practical application. Hemodialysis patients often face restrictive dietary recommendations to limit phosphorus, potassium, and fluid intake, leading to frustration, a sense of diminished autonomy, and perceived dietary limitations. A multidisciplinary approach is essential for updating medical needs, ensuring dietary adherence, and preventing malnutrition and inadequate dialysis. This study explores the potential of integrating traditional dietary principles, including a plant-based diet, into the nutritional management of dialysis patients, proposing a holistic and personalized approach grounded in ancient wisdom.

This paper addresses these challenges through a comprehensive review of scientific publications on renal diets compared to the data of the nutritional profiles of food items suggested in the traditional dietary literature for renal disorders. This analysis aims to identify synergistic benefits and innovative dietary interventions. Traditional nutrition emphasizes individualized diets, considering the unique needs of each patient. Integrating macronutrient considerations, fluid control, and core principles from traditional dietetics with contemporary scientific insights can enhance patient outcomes.

Innovative gut modulatory interventions, such as specific cooking techniques, spice formulations, and a variety of plant-based foods, are highlighted as key components of this integrated approach. These modalities enhance the palatability and nutritional value of the diet and also support gut health. Cooking techniques for nutrient integrity, the use of spices with anti-inflammatory prebiotic effects, probiotics, and diverse plant-based foods contribute to a holistic dietary strategy.

This paper explores the emerging trends and innovative approaches advocating for the integration of traditional dietary concepts and plant-based nutrition into renal diet management to improve patient adherence, satisfaction, and health outcomes.

4.19. Intestinal Microbiota, Metabolic Syndrome, and Mediterranean Diet: Pathophysiological Mechanisms and New Potential Therapeutic Approaches

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The human intestinal microbiota (IM) is defined as the microorganisms community present in the gastrointestinal system, which plays a crucial role in metabolic syndrome (MS) onset. A reduction in *Proteobacteria*, *Streptococcus*, *Enterococcaceae* and *Clostridium* was observed in favor of a greater presence of *Bifidobacteriaceae* and *Akkermansia*; the latter is significantly related to an improvement in MS. Additionally, the increase in the *Firmicutes*/*Bacteroidetes* ratio is associated with a worsening in MS and body weight, while the presence of *Lactobacillus reuteri V3401* correlates with a reduction in IL-6 and sVCAM-1. Recent evidence showed that the occurrence of *Muciniphila* species is associated with insulin sensitivity reduction, while *Klebsiella pneumoniae* is related to the development of non-alcoholic fatty liver disease, *Ruminococcus* to obstructive sleep apnea syndrome and *Enterobacter cloacae B29* to obesity. Moreover, the pancreas and sensitive insulin tissues can be influenced by muropeptides and other degradation products of IM that cross the intestinal barrier (post-biotic products). Interestingly, about several variations in IM populations are attributable to feed, and the Mediterranean dietary (MD) pattern is correlated to an increase in bacterial species considered positive for health. At this purpose, the production of short-chain fatty acids due to the fermentation of soluble fibers by the IM is able to fortify the gastrointestinal barrier and increase satiety. Furthermore, oleic acid also appears to have positive effects on bacterial transmigration and inflammatory response induced by lipopolysaccharide, arousing interest in experimental models of sepsis treatment. Therefore, by acting on the main modifiable factors regarding the balance between IM and the host organism, it is possible to strengthen the homeostasis and health of both systems. The aim of this presentation is to review the mechanisms of interaction between IM and MD and their effects on MS, thus opening up new avenues for research and novel therapeutic approaches.

4.20. Inulin's Health Effects and Mechanisms of Action in Human Metabolism

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Inulin is a plant polysaccharide that is used by a wide variety of plants as an energy store. Structurally, it consists of d-fructofuranose units, linked by β (2→1) bonds, usually with a glucose moiety attached to the end by an α (1→2) bond. Inulin is not digestible by human gut enzymes, but it can be digested by some bacteria of the human microbiota, acting as a prebiotic. Due to this condition, during the last years, different studies have been conducted focused on the potential application of inulin as a food ingredient with

health-promoting activities against metabolic syndrome diseases. However, the specific effects and mechanisms of action of inulin are still unclear.

Here, we present a bibliographic review of human intervention studies evaluating the effect of inulin supplementation on metabolic parameters to gather evidence on its potential benefits and to describe its mechanisms of action. The study includes studies published in PubMed during the last years.

At the microbiota level, the main effect produced by inulin is the selective favoring of beneficial species in the colon, especially those belonging to the genera Bifidobacterium and Anaerostipes, which have been found to be associated with improved insulin sensitivity, glycemic levels, and anthropometric parameters. In addition, it has been seen that by competitive exclusion, pathogenic species, such as those of the Clostridium genus, are negatively affected.

On the other hand, inulin fermentation produces short-chain fatty acids, which positively affect different metabolic parameters. They improve glucose metabolism and decrease hepatic lipogenesis, improve intestinal barrier functions, reduce inflammation, modulate immune activity, and improve anthropometric parameters such as weight or BMI.

In conclusion, the scientific evidence analyzed suggests that inulin intake produces positive health effects through the improvement in the intestinal microbiota and through the metabolites produced by its fermentation.

4.21. Nano-Encapsulated Ebastine Niosomal Transdermal Nanogels: Qbd Model for Allergy Treatment and Evaluation

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Niosomes are a non-ionic surfactant-based vesicular system obtained via the hydration of non-ionic surfactants with cholesterol (to impart rigidity). Among various vesicular systems, the niosome provides stability, while the leakage of the drug can be avoided; so, they are considered as a suitable approach. The present study aimed to improve patient compliance in treating skin allergic reactions, and an attempt was made to create a niosomal nanogel loaded with ebastine. Thin-film hydration was used to prepare niosomes using cholesterol, Span 60, Tween 80, and ebastine; the procedure was optimized using a Box–Behnken design. A dispersion method was used to prepare niosomal gels with carbopol 934 as the gelling agent for a more effective therapeutic result. Ebastine-loaded niosomal nanogels were prepared and evaluated for drug excipient compatibility using FTIR, which revealed that the formulation was compatible. The percentage drug entrapment efficiency was found to be 84.19%, the zeta potential was −27 mV, and the vesicle size was between 100 and 300 nm. Nanogels were also evaluated to determine the pH of the gel, their in vitro drug release, and their stability; acceptable results were found. This study shows the successful development of ebastine-loaded niosomal nanogels with improved penetration, good homogeneity, and stability. It can be concluded that ebastine-loaded niosomal nanogels could be an effective treatment for skin allergic reactions when applied transdermally.

4.22. Unmasking the Therapeutical Potential of Cuscuta reflexa Against Isoproterenol-Induced Cardiotoxicity in Rats

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Objectives: This study aimed to establish the protective role of *Cuscuta reflexa against* isoproterenol-induced myocardial infarction in Wistar albino rats.

Materials and method: Phytochemical screening, acute toxicity study, and then in vivo isoproterenol-induced myocardial infarction were carried out. During the study period, biochemical, cardiac marker, electrograph, and antioxidant evaluations were conducted. In the end, an antioxidant and histopathology study was carried out using Olympus binuclear at 45 X using eosin and hemoxylin stains.

Result: This study demonstrated the presence of phytochemicals such as alkaloids, carbohydrates, glycosides, saponins, proteins, amino acids, tannins, flavonoids, and steroids. No mortality and morbidity were observed until 2000 mg/kg doses. During the in vivo study, the protective role of *Cuscuta reflexa* on the restructuring of electrographic parameters QT, P wave, RR interval, PR intervals, QRS complex, and heart rate was observed. In the serum biomarker test, recovery to the average level from elevated ALT, AST, CK-MB, CK-NAC, and LDH was observed in treatment groups. Enzymatic antioxidants were found to be protective in a dependent manner. The histopathological finding suggested the significant recovery of reversible cellular injury characterized by striation, cellular necrosis, vacuoles, interstitial spaces, neutrophils, and macrophage infiltration regarding the ethanolic extract of *Cuscuta reflexa.*

Conclusions: The present study highlights the presence of secondary metabolites such as carbohydrates, flavonoids, glycosides, alkaloids, tannins, and saponins. We also discussed the protective role against electrocardiographic changes, elevated cardiac biomarkers, anti-inflammatory parameters, free radicals, and reversible or irreversible cellular injury.

4.23. Plant-Based Diets and Migraine Management: Current Evidence and Future Directions

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Plant-based diets are rich in fruits, vegetables, whole grains, and legumes, and they are known for their anti-inflammatory properties due to high levels of antioxidants, vitamins, and minerals. Chronic inflammation is linked to migraine; therefore, reducing inflammation may help manage migraine symptoms. These diets provide nutrients such as magnesium, riboflavin, and coenzyme Q10, which have been shown to reduce migraine frequency and severity. Plant-based diets may promote a healthy gut microbiome, influencing brain health through the gut–brain axis. Gut bacteria imbalances and dysbiosis have been linked to migraine.

Clinical studies indicate that plant-based diets may reduce migraine frequency and intensity. According to the current literature, a low-fat, plant-based diet reduced migraine pain in a small group of participants. The beneficial effects of plant-based foods are proposed to be multidimensional. These diets typically reduce the intake of processed foods, red meat, and dairy, which can be pro-inflammatory and trigger migraine. A high nitrate intake from vegetables like spinach and beets can influence blood flow and may alter migraine occurrence, necessitating further research. Understanding the biological mechanisms through which a plant-based diet impacts migraine pathophysiology is encouraged, including the roles of the gut–brain axis, inflammation, and vascular health.

There are limited data on the long-term effects of a plant-based diet in individuals with migraine, necessitating longitudinal studies to understand sustained benefits. Further research is needed to identify the specific components of plant-based diets most effective in preventing or reducing migraine. The effectiveness of plant-based diets for migraine may vary due to genetic factors, gut microbiota composition, and individual food sensitivities. Comparative studies between plant-based and other dietary interventions, like ketogenic or elimination diets, are necessary to determine the relative efficacy in managing migraine. More randomized controlled trials with larger sample sizes are essential for providing robust evidence.

4.24. Plant-Based Nutrients as Therapeutic Agents in Neurodegenerative Diseases

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We are constantly looking for novel approaches that either enhance biological functioning or improve our state of physical health and mental well-being. The possibility of contracting a wide range of diseases, including neurological conditions like Alzheimer's, Parkinson's, and Huntington's disease, is mostly driven along by environmental factors, aging process conditions, and an inadequate nutrition diet. Mainstream medication, despite being extensively used for symptomatic treatment, has restricted therapeutic effectiveness. Around 25 centuries ago, Hippocrates, the father of medicine, said "Let food be thy medicine and medicine be thy food" and anticipated the connection between foods for health and their unique and special therapeutic benefits; the market was introduced to nutraceuticals. Nutraceutical refers to a combination of nutrient and pharmaceutical. The plant-based nutrition therapies work in a physiological fashion without having a serious negative impact. Multiple studies have clearly highlighted the part that nutraceuticals play in combating neurodegeneration, and experts have convincingly proved the therapeutic efficacy of plant-based nutraceuticals in neurodegenerative disorders. Vitamin C, resveratrol, and lycopene are some of the compounds that have shown therapeutic potential against neurodegeneration. Nutraceuticals have already shown promising outcomes in the healthcare industry, and their consumption is rising steadily in the global market. The aim of this article is to emphasize the significance of these plant-based nutrition supplements and assist consumers in selecting superior and healthier options alongside standard neuroprotective drugs to tackle such conditions in a much better and more efficient way.

4.25. Relationship Between Serum Vitamin D Levels and Otic Affection in Preschool Children

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Introduction: In recent years, various approaches have been used to assess vitamin D serum levels in pediatric patients. The purpose of this study was to establish a correlation between recurrent acute ENT (ear, nose, and throat) infections in pediatric patients and their vitamin D serum levels.

Materials and Methods: We included pediatric patients who presented with recurrent acute suppurative otitis media (more than three episodes in the last 6 months). We conducted accurate objective ENT endocavitary examinations and thorough medical histories to assess the developmental conditions and onset of unilateral and bilateral acute otitis media. The study group consisted of children aged between 2 and 6 years who presented with fever, otalgia, nasal obstruction, and purulent rhinorrhea. Otoscopy was used to evaluate the condition of the tympanic membrane during suppuration with or without perforation. All children underwent serological testing to determine their vitamin D serum levels.

Results: The current study revealed a notable prevalence of otitis media with a higher incidence observed in boys. There was a significant correlation found between vitamin D deficiency and the prevalence of these conditions. Ensuring optimal vitamin D levels may play an integral role in reducing the recurrence of suppurative otitis media in preschool-aged children.

In recent years, the necessity of vitamin D supplementation, particularly in cases where sun exposure is insufficient, has been increasingly recognized.

4.26. Systematic Review of Clinical Trials on the Potential of Probiotics for the Treatment of COVID-19

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In recent decades, new deadly coronaviruses causing highly infectious diseases have emerged in human society, resulting in threats to public health and the global economy. In December 2019, in the province of Wuhan, China, the severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) emerged. This infection was classified as the coronavirus disease 2019 (COVID-19) pandemic. Probiotics are live microorganisms whose administration in adequate quantities has been associated with health benefits for the host, contributing to the treatment and prevention of multiple pathologies. The present study aims to review scientific evidence on the impact of probiotic treatment on the progression of morbidity due to SARS-CoV-2. The research was conducted in the Cochrane Library, Clinical Trials, EBSCO, Medline, Web of Science, and Science Direct databases. Inclusion criteria were as follows: study period between 2019 and 2023; language in English or Portuguese; methodology based on clinical trials; studies in humans with a confirmed diagnosis of SARS-CoV-2 and administration of probiotics in the treatment of the pathology. Five studies were included in this review, recruiting a total of patients ranging from 23 to 300 individuals. The main positive results of the probiotic intervention compared to the control group were nearly an improvement in digestive symptoms (65% vs. 88%, *p*-value 0.06) and overall symptoms (88.6% vs. 70.8%; *p*-value 0.03). Also, in the probiotic group, there was an increase in serum concentrations of immunoglobulin G (IgG) in the receptor-binding domain/spike 1 (RBD/S1) (225.9 vs. 105.6 binding antibody units/mL, *p*-value 0.05). The major limitation is related to the fact that in all five studies, patients were concomitantly treated with several other drugs whose action may have influenced the observed results. The conducted studies suggest that the use of probiotics enhances a decrease in morbidity in SARS-CoV-2, although more studies are needed to confirm their efficacy in the disease.

4.27. The Biochemical Properties of Red Garlic: A Narrative Review of Laboratory Studies

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The consumption of garlic (*Allium sativum*), recognized for its historical medicinal significance, is linked to diverse health benefits: notably, red garlic stands out for its distinct anthocyanin content, contributing to its unique pink–purple clove color. However, despite extensive research on the therapeutic properties of garlic extracts, there remains limited evidence specifically addressing the therapeutic potential of red garlic. A narrative search was conducted in February 2024 on PubMed and Google Scholar to identify relevant studies examining the biochemical properties of red garlic extracts. Following the search of selected databases, 789 articles were retrieved. Ten laboratory studies exploring the impact of red garlic extracts on laboratory models of lung and digestive tract phlogosis, cancer, microbial proliferation, obesity, and responses to inflammation or oxidative stress were included in this literature review. The studies analyzed both aged and fresh red garlic extracts with a specific emphasis on water extracts. The outcomes highlighted significant antioxidant and anti-inflammatory properties of red garlic extracts, also suggesting potential pro-metabolic effects that could be beneficial in addressing excessive weight and dyslipidemia. The findings also pointed to the inhibitory effect on cancer cell proliferation of red garlic by-products and the superior anti-inflammatory profile of the hydroalcoholic extract. Comparative analyses between red and black garlic extracts indicate inconclusive

evidence regarding antioxidant activity. The findings also suggested a high level of tolerability for the gut microbiota. This literature review aims to provide valuable insights into the therapeutic potential of red garlic extracts and emphasizes the need for further research to fully elucidate their benefits and mechanisms of action.

4.28. The Efficacy of Millet-Infused Diets in the Regulation of Metabolic Conditions like Diabetes, Obesity, and Hypertension

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Millet-incorporated foods are primarily made from millet, a small-seeded grain widely consumed in Asia and Africa, and include various types like sorghum, pearl millet, finger millet, and fonio. Millet, a gluten-free grain, is beneficial for those with celiac disease or gluten sensitivity, and it can be incorporated into dietary regimens to address metabolic disorders. Consuming millet in moderation is crucial for a balanced diet, but individuals with metabolic conditions should consult a healthcare provider or a qualified dietitian before modifying their diet. Millet-based foods can help manage disorders by promoting gradual blood sugar increase due to their low glycemic index, unlike high-glycemic foods like white bread and potatoes. Millet's high fiber content aids in weight management, reducing obesity risk, and slows digestion, making it an effective choice for individuals with diabetes. Millet is a rich source of essential nutrients like magnesium, potassium, and vitamin B6, which help reduce blood pressure and enhance insulin sensitivity, which are crucial for overall health. Millet is rich in antioxidants, which can help reduce inflammation and protect against chronic diseases like heart disease and cancer. This study focuses on dietary patterns like (Dietary Approaches to Stop Hypertension) DASH and Mediterranean diets that can reduce the risk of non-communicable diseases (NCDs) and improve treatment, promoting minimally processed, unprocessed foods and limiting high-fat meals.

4.29. The Role of Melatonin in Enhancing Intermittent Fasting-Induced Nutritional Ketosis for Treating Metabolic Dysfunctions

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Melatonin, a potent antioxidant, improves energy metabolism and reduces inflammation. It modulates insulin secretion, regulates lipid metabolism, and may reduce low-grade inflammation in obesity. Melatonin influences adipose tissue development, lipid accumulation, body weight, and brown adipose tissue activation, playing a crucial role in energy homeostasis. Notably, melatonin levels are lower in obese individuals.

The present study evaluated melatonin's effect on intermittent fasting-induced nutritional ketosis in obese mice. Four groups of mice were studied: control, obese, ketosis without treatment, and ketosis treated with melatonin. Melatonin improved tissue morphology in the brain, liver, and kidney, as revealed by the histological analysis, and it balanced the biochemical parameters. The control group showed normal blood values, while the obese group had increased blood glucose, cholesterol, and triglycerides. Ketosis alone reduced these values, and melatonin further amplified these effects. Interestingly, a significant increase in serum lipid levels was registered, namely total cholesterol and serum triglycerides, which were observed in the group of mice on ketosis and treated with melatonin. This increase in lipemia can be attributed to the intermittent 20/4 fasting regimen, which likely mobilized lipid stores to meet the animals' caloric needs. Consequently, these mobilized lipids were transported to hepatocytes' mitochondria for beta-oxidation, resulting in the production of acetyl-coenzyme A, which enters the Krebs cycle—the primary energy production pathway in living organisms.

This study concludes that melatonin supplementation partially alleviates early-stage obesity pathogenesis.

5. Session 4: Global Nutrition Trends: Shaping Health and Athletic Performance

5.1. Acute Effect of Beetroot Juice Supplements on Aerobic Performance of Endurance in Female Athletes: A Randomized Controlled Trial Study

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Beetroot juice (BRJ) contains a high concentration of inorganic nitrates, which have been previously shown to improve blood flow to skeletal muscle. Recent studies in males have found that acute BRJ supplementation can improve aerobic exercise performance. However, the effects of BRJ supplementation on exercise performance in females is currently unknown. Purpose: This study aimed to determine the effect of BRJ supplementation on aerobic performance in females. Methods: This study was a randomized placebo-controlled trial where participants (n = 18), healthy trained females (22.9 ± 5.6 years, 165.8 ± 7.14 cm, 64.0 ± 0.57 kg), were divided into three different groups: the placebo group (PLG; n = 9), the BRJ group (n = 9), and the BRJ concentrate group (50 mL) (~8.2 mmol NO_3^-). Three hours after taking the supplement, participants completed cardiopulmonary exercise testing (CPET) on a cycle ergometer at a constant work rate (W), using a gas exchange measurement, including the uptake of oxygen (V̇O2) and exhaled carbon dioxide (V̇CO2) with traditional exercise testing parameters. Results: The results of maximal oxygen consumption in the BRJ group in the first test and in the second test after 50 mL BRJ showed significant (p 0.001) changes after the second test. Maximal oxygen consumption (VO2max) increased by 4.82% (from 35.24 ± 5.07 to 36.94 ± 4.91) in contrast with the PLG where results decreased by 0.57% between the first test and the second test (from 35.06 ± 4.87 to 34.86 ± 5.01). Respiratory efficiency (VE/VO2) increased by 0.84% in the PLG (from 34.53 ± 2.67 to 34.79 ± 3.38) and decreased by 4.25% in the BRJ group (from 35.01 ± 2.38 to 33.52 ± 2.10). Conclusion: These data demonstrate that dietary supplementation with NO_3^- can be considered an ergogenic aid and may have therapeutic effects in hypoxic environments as well as improve cardiovascular health in female athletes.

5.2. Comparative Efficiency of EPO-Boost Natural Blood Builder and Blood Booster Active 17 Supplementation on Hematological Biomarkers and Athletic Performance in CrossFit® Athletes: A Randomized Placebo-Controlled Trial

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Introduction: Iron is essential in athletes' performance, as it is essential in cellular respiration and metabolism. However, the increased demand for iron due to strenuous and demanding exercise, along with dietary iron insufficiencies, amplifies the risk of iron deficiency and possibly anemia.

Methods: Our study aimed to evaluate the comparative efficacy of oral supplementation with EPO-Boost Natural Blood Builder (EB) and Blood Booster Active 17 (BB) after 10 weeks of programmed training in 32 male CrossFit® athletes (26.0 ± 5.7 years; 180.3 ± 7.9 cm; 23.9 ± 1.7 kg/m^2). Participants were randomized into three groups and received EB, BB, or a placebo (control group: CG), with the same structured training and diet, in a single-blind, placebo-controlled, randomized trial.

Results: Statistically significant differences were found only in serum ferritin (FER) levels (p = 0.015; η^2p = 0.326). The CG experienced a 14.33% decrease, the EB group displayed a 3.60% increase, and the BB group showed a 20.22% increase. Although no statistically significant changes were detected in serum iron levels (sFe) (p = 0.383; η^2p = 0.032), it is noteworthy that there was a 10.58% decrease in the CG and a 23.76% increase in the BB group. Significant differences were found in iron storage levels in the CG (p = 0.031) throughout the study. In this regard, three CrossFit® athletes who were categorized with adequate iron levels at the beginning of the intervention shifted to a state of functional iron deficiency at the end of the study. Regarding athletic performance, no statistically significant differences were observed in aerobic (p = 0.483; η^2p = 0.072) or anaerobic (p = 0.83; η^2p = 0.035) thresholds between the CG, EB, and BB.

Conclusions: Supplementation with EB and BB improves FER levels and could help prevent iron deficiency, although this does not translate into increased athletic performance.

5.3. Evolving Foodways in Morocco: A Review of Dietary Transitions and the Enduring Influence of the Mediterranean Diet

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Background: Morocco boasts a rich culinary landscape shaped by regional variations, geography, and historical influences. The traditional Moroccan diet shares key features with the Mediterranean diet, emphasizing fresh produce, unsaturated fats, whole grains, and communal dining. **Objective**: This review explores the evolving food situation in Morocco, considering both historical transitions and the recent impact of the COVID-19 pandemic. **Methodology**: This review examines the evolution of Moroccan dietary patterns from 2001 to 2023. It draws on the existing literature (scholarly articles from databases like Google Scholar, PubMed, Web of Science, and Research Gate, government reports, and credible online resources) in English, French, and Arabic. The keywords used were Moroccan gastronomy, Mediterranean diet, nutritional intake, food transition, societal changes, globalization, economic development, and the COVID-19 pandemic. The review also considers government initiatives promoting healthy eating practices aligned with the principles of the Mediterranean diet. **Results**: Moroccan dietary habits have undergone significant transformations over time. Societal changes, globalization, and the COVID-19 pandemic have raised awareness of health-conscious food choices with a rising preference for local, organic, and nutrient-rich products. Despite these transitions, Moroccans exhibit a strong commitment to preserving their culinary traditions and the core principles of the Mediterranean diet. **Conclusions**: The Moroccan diet demonstrates remarkable resilience, reflecting a balance between tradition, nutritional needs, and cultural identity. Government initiatives promoting healthy eating through the Mediterranean diet underscore our commitment to a healthier nation. However, further national studies are vital to validate and expand existing knowledge, particularly in light of the dynamic nature of Morocco's nutritional landscape within a global context. This review highlights the need to reconcile the benefits of modernization with preserving Morocco's rich culinary heritage. We plan to

update this analysis with data from the upcoming 2024 population census, incorporating new insights into evolving dietary trends.

5.4. Nutrition Knowledge, Attitudes, and Dietary Practices Among Footballers at Lead City Football Academy

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Inadequate nutrition knowledge among football players might lead them to indiscriminately use dietary supplements and opt for unhealthy food choices. Adequate knowledge of nutrition is believed to influence the performance of footballers; improving nutrition knowledge helps foster optimal performance by improving dietary practices and attitudes. This study examined the nutrition knowledge, attitudes, and dietary practices of footballers at Lead City Football Academy. A descriptive cross-sectional study design was adopted, and a purposive sampling technique was employed to select 100 male football players for this study. A semi-structured questionnaire was the instrument for data collection. The questionnaire consisted of sections on personal data, nutrition knowledge, attitudes toward nutrition, dietary practices, and food frequency consumption. Overall, 90.9% reported having received tertiary education. It was observed that 62.6% of respondents were aged between 18 and 20 years with a mean age of 19.02 years ($\pm$2.290 SD). The sources of nutrition information identified by the footballers were coaches (46.5%), social media (34.3%), nutritionists (31.3%), schools (12.1%), and TV (12.1%). Additionally, 57.6% agreed that basic sugars are suitable energy sources, while a majority (96.0%) agreed that vitamin supplementation is recommended for physically active people. The findings also revealed that the majority of the footballers had positive attitudes toward the importance of good eating habits for health (100%) and that coaches had a good attitude toward nutrition (97.0%), and they also recognized the impact of food choices on physical performance (96.0%). Our findings suggest that Lead City footballers have optimal dietary practices and good nutrition knowledge. Encouraging ongoing nutrition education from coaches, particularly dietitians and nutritionists, is essential to continuously refine and enhance nutrition knowledge, attitudes, and practice among the footballers. Individualized nutrition support may help these footballers meet their nutrition requirements and support their health and performance.

5.5. Potential of Bicarbonate (HCO_3-) in Coping with Difficult Training Loads and pH Homeostasis

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Background: Acidosis, one of the body's post-exercise responses, is important for athletic performance due to its effect on the pH level. The accumulation of hydrogen ions (H^+) after exercise causes a decrease in myoplasmic pH, which leads to fatigue. This study aims to compile studies examining the effect of sodium bicarbonate supplementation on the pH level under challenging training conditions. **Method:** In the study, studies conducted in the past decade were examined using the keywords "training, pH and bicarbonate" using the Pubmed, Web of Science, Scopus, and Google Scholar databases. Thus, 532 studies were reached. These articles were limited to studies in the form of aerobic training, anaerobic training, and high-intensity interval training. Additionally, pilot

studies, systematic/meta-analysis reviews, congress abstracts, case reports, and those not published in English were excluded. In this context, seven articles were included in the research. **Results:** It has been observed that the pH decreases to an acidic level in athletes who do not take sodium bicarbonate supplements during intense training periods. It has also been observed that the pH level remains normal in athletes taking sodium bicarbonate. In addition, it is understood that the pH levels of athletes taking sodium bicarbonate supplements remain at normal levels, but there are increases in maximum running speed, strength, and power parameters. Moreover, sodium bicarbonate supplementation also led to a decrease in blood lactate levels. **Conclusions:** Athletes can keep the pH at an acceptable level and improve performance parameters with sodium bicarbonate supplementation during intense training or competition periods.

5.6. Sodium Intake in Young University Students from Leicester (England)

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The World Health Organization (WHO) recommends an intake of sodium chloride (salt: 40% sodium and 60% chloride by weight) of 5 g (about 2 g of sodium). The dietary intake of sodium (Na) was assessed in young adults at De Montfort University (DMU, UK). Comprehensive nutrient intake information was collected from 111 (20.45 yrs old; 78 female) DMU students between 2015 and 2016 from three major ethnic backgrounds (41 from Asia, 41 from Africa, 27 from Europe) using a validated variant of the Nutrition Norfolk Food Frequency Questionnaire. According to their BMI values, 25.7% and 8.3% of this population were overweight and obese, while 9.2% were underweight. The number that were overweight is three times that of the national average in this age group, 10.6%. The dietary intake of Na was significantly higher in male participants (2878.48 vs. 2144.05 mg/day; p-value = 0.0028), which might be explained by their higher intake of foods that have been identified as primary sources of sodium in a number of comprehensive studies, specifically meat (271.553 vs. 193.063; p-value = 0.016), cereals (202.74 vs. 169.91; p-value = 0.0842) and cow's milk (228.09 vs. 163.55; p-value = 0.037; all in g/day). The dietary intake of Na was much lower in individuals with a lower BMI [underweight (1948.22) obese (2361.92) overweight (2377.72) normal weight (2417.54), p-value = 0.830; all in mg/day] although not significantly. This is in line with studies that have suggested that a high sodium intake may contribute to promoting weight gain. The dietary intake recorded for the whole DMU group (2359.66) was much higher than that described in a Spanish adult population (2026 mg/day), which might be logically due to differences in the intake of ready-to-eat and processed meals between both countries. The authors of that study also reported significantly higher sodium intakes in Spanish men. Our study highlights the need for further public health policies in England to address the WHO recommendations, as most students exceeded the recommended intake of sodium.

5.7. The Mediterranean Diet as a Sustainable Dietary Pattern for Sports Nutrition: From the Tradition of Typical Products to the Athletes' Nutritional Requirements

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The Mediterranean diet (MD) is globally and historically recognized as the most health-promoting dietary pattern in various clinical contexts and physiological conditions. Of interest, the MD is not only a sustainable dietary pattern that includes elements recognized as distinctive, such as seasonality, conviviality, culinary activities, biodiversity, traditional local and eco-friendly food products, but also a healthy lifestyle characterized by adequate levels of physical activity. This may be the case for sportspeople/athletes, whose nutritional needs often lead them to adopt particular/extreme dietary approaches or away from Mediterranean style. Recommendations of sports nutrition (SN) and MD characteristics can be combined or, at least, mutually adapted in athletes' diets, making them Mediterranean-style while meeting their nutritional needs. These nutritional aspects can be adapted by promoting a Mediterranean-type dietary pattern through the regular consumption of typical and traditional local foods. In this sense, the Campania region boasts the largest number of registered traditional products in Italy (source from Regional Agriculture Department), including plant-based products with significant nutritional value and marked nutraceutical potential, which can sometimes minimize the need for supplementation. Examples are cultivars of cereals, legumes, potatoes, and chestnuts as important carbohydrate sources for sportspeople or typical varieties of maize, beans or dairy products as an important source of leucine, which is fundamental for stimulating muscle protein synthesis. Equally noteworthy is the abundance of phytochemicals in many typical foods and agrifood by-products. Additionally, the use of typical and traditional products outlines the sustainability and low environmental impact of the MD, as it can significantly reduce resource consumption and environmental footprint. The MD, based on the regular consumption of the Mediterranean region's traditional foods, thus may represent a good example of a sustainable food model that can also be applied to SN, and its use should be encouraged in order to respect the environment and valorize the excellence of our territories.

5.8. Young Male and Highly Physically Active University Students Have Higher Animal-Sourced Protein Intake and Greenhouse Gas Emissions

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Introduction: One of the proposed strategies for supporting food system sustainability is replacing animal-sourced protein with plant-sourced proteins, since it may result in a significant reduction in land use and greenhouse gas emissions. This study aimed to assess the difference in characteristics of university students regarding their low or high intake of animal-sourced and plant-sourced protein.

Methods: Students at the University of Rijeka, Croatia aged 19 to 27 years (N = 224, 46% females, 53% junior) noted sociodemographic data and dietary intake. Anthropometric and body composition parameters were measured. The diet sustainability was assessed through the Planetary Heath Diet Index (PHDI). Greenhouse gas emissions (GHGE) data were obtained from the literature with the SU-EAT method. Students were divided into two groups: high animal-sourced/low plant-sourced protein intake (HAP/LPP) (N = 36, 16%), and low animal-sourced/high plant-sourced protein intake (LAP/HPP) (N = 34, 15%)

based on intake quartiles. The chi-square test was used for testing the difference between groups differences, while logistic regression was used to assess the odds for high animal-sourced protein intake.

Results: The LAP/HPP intake group consisted of significantly more females (59% vs. 25%; $p = 0.004$), and moderately physically active students (54% vs. 31%; $p = 0.004$), and it had higher PDHI scores (62.21 vs. 51.53; p 0.001) and lower GHGE (1.82 vs. 2.57 kg CO_2/1000 kcal; p 0.001) compared to the HAP/LPP group. Age ($p = 0.216$), university degree ($p = 0.836$), BMI ($p = 0.069$), nutritional status ($p = 0.345$) and smoking status ($p = 0.885$) did not differ significantly between groups. Significant higher odds for higher animal-sourced protein intake were male sex (OR = 16.40, p 0.001) and high physical activity (OR = 3.46, $p = 0.005$). Students with higher animal-sourced protein intake had a five times higher chances of higher GHGE than those with higher plant-sourced protein intake (OR = 4.83, $p = 0.002$).

Conclusions: A healthy and sustainable diet education specifically targeting male and physically active students by strengthening their knowledge and skills in choosing and preparing food with plant-sourced proteins.

6. Session 5: Behavioral Approaches to Healthier Eating

6.1. Factors That Influence the Consumption of Plant-Based Milk Versus Cow's Milk in a UK Population

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To reduce climate change, governments and global organizations are increasingly recommending the reduced consumption of animal-based foods and a shift to plant-rich diets. However, there is still much confusion amongst the public as to which foods are nutritionally the healthiest and how best to reduce the emission of greenhouse gases. Extensive research has been carried out to assess the motivations for turning to a vegetarian or vegan diet, but research into factors influencing the consumption of dairy or plant-based beverages is more limited. This study aimed at determining the current factors that influence the consumption of plant-based milk vs. cow's milk. The participants were 265 adults based in the UK who solely consumed either plant-based milk or cow's milk. Data were gathered through an online cross-sectional survey. Plant-based milk drinkers were likely to have a more left-wing political view than cow's milk drinkers, but there was no significant difference between groups in age, gender, physical activity or household income. Results from a binomial logistic regression showed that the influence of environmental and ethical impact, intolerance and allergy concerns and dietary preference enhanced the probability of being a plant-based milk drinker. The influence of health and friends and family reduced the likelihood of being a plant-based milk drinker. These findings may offer valuable insights into the factors influencing milk choices and contribute to the broader dialogue on promoting sustainable nutritional consumption.

6.2. Exploring Behavioral Approaches to Foster Healthier Eating Habits: A Comprehensive Review

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Introduction: In the pursuit of healthier living, dietary choices play a pivotal role. Behavioral approaches have emerged as potent tools to address the complexities surrounding eating habits. The exploration of various behavioral strategies aimed at promoting healthier eating patterns is the focus of this study.

Methodology: A systematic review was conducted, encompassing peer-reviewed articles, meta-analyses, and clinical trials published between 2010 and 2024. Key databases including PubMed, PsycINFO, and Web of Science were searched using predefined criteria. Selection focused on studies elucidating behavioral interventions targeting dietary behaviors across diverse populations.

Findings: This review identified a plethora of behavioral interventions fostering healthier eating habits. Techniques such as goal setting, self-monitoring, and environmental restructuring emerged as effective in promoting dietary changes. Tailored interventions, utilizing technology and incorporating social support mechanisms, exhibited promising outcomes. Additionally, mindfulness-based approaches demonstrated efficacy in reducing impulsive eating behaviors and enhancing dietary self-regulation. Furthermore, insights into the role of behavioral economics in shaping food choices shed light on innovative strategies for nudging individuals toward healthier options.

Conclusion: Behavioral approaches offer multifaceted avenues to cultivate sustainable changes in eating behaviors. By leveraging diverse strategies tailored to individual needs, these interventions hold immense potential in promoting healthier dietary patterns and mitigating the burden of diet-related chronic diseases. This review underscores the importance of integrating behavioral science into public health initiatives to foster long-term improvements in dietary habits and overall well-being.

6.3. Revolutionizing Dietary Behavior: Harnessing Technology for Healthier Eating Habits

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Introduction: Innovations in technology offer unprecedented opportunities to transform dietary behaviors and promote healthier eating habits. This research article explores the integration of technology-driven interventions, behavioral science principles, and personalized approaches to revolutionize dietary behavior and support long-term health and well-being.

Methods: A pioneering longitudinal study was conducted, leveraging cutting-edge technologies such as mobile applications, wearable devices, and artificial intelligence algorithms. Participants were provided with personalized dietary recommendations, real-time feedback on eating behaviors, and tailored interventions based on their individual preferences and goals.

Results and Discussion: The results demonstrate the efficacy of technology-driven interventions in promoting healthier eating habits and facilitating sustained behavior change. Participants experienced improvements in dietary quality, increased adherence to dietary guidelines, and reduced consumption of unhealthy foods. Moreover, the integration of personalized feedback and tailored interventions led to greater engagement and motivation, fostering long-term adherence to healthier eating patterns.

Conclusions: The integration of technology into dietary behavior interventions represents a paradigm shift in health promotion, offering scalable and personalized solutions to support healthier eating habits. By harnessing the power of technology-driven approaches and behavioral science principles, individuals can overcome barriers to dietary change and achieve lasting improvements in health and well-being. This research article underscores the transformative potential of technology in promoting healthier dietary behaviors and highlights the importance of continued innovation in this field.

6.4. Attenuation of Muscle Loss and Functionality Through Diet in Patients with Muscle Atrophy-Associated Inflammation: A Bibliographic Review

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Introduction: Muscle atrophy can be generated by various factors: inflammation, malnutrition, aging, and a pro-inflammatory diet. The latter can lead to muscle wasting by promoting oxidative stress and thus activating the pro-inflammatory response via pro-inflammatory cytokines such as IL-6 and TNFα, which in turn can trigger insulin resistance, obesity, and type II diabetes as well as alter muscle regeneration and cause aging. Oxidative stress and the impairment of antioxidant defenses promote an imbalance in homeostasis, leading to muscle atrophy and mitochondrial dysfunction. Bioactive substances can prevent the loss of muscle mass and promote functional recovery.

Objective: To review the association between inflammation and muscle atrophy and how dietary compounds can attenuate muscle loss.

Methods: A bibliographic search was conducted in the Medline, Web of Science, and Scopus databases including articles published in the last 10 years in English and Spanish.

Results: Food phytochemicals can prevent muscle protein degradation, promote protein synthesis, support anti-inflammation, and downregulate atrophy gene expression. Extra virgin olive oil and its phenolic compounds (oleuropein, hydroxytyrosol, and tyrosol) act by eliminating ROS, activating anabolic pathways, and counteracting mitochondrial and inflammatory alterations. DHA prevents palmitate-induced atrophy by inhibiting mitochondrial ROS production. Selenium is associated with a decrease in IL-6, TNF-α, and myostatin; vitamins A, C, and D reduce oxidative stress and the expression of MuRF1 and MAFbx. Curcumin decreases NF-κB, TNF-α, IL-1β, MuRF1, and MAFbx as well as muscle proteolysis. Resveratrol increases mitochondrial biogenesis and decreases MuRF-1 and mitophagy. Astaxanthin decreases oxidative stress, proteolysis, apoptosis, and ROS. Epicatechin (a cocoa flavonoid) modulates biomarkers such as FoxO1A and MuRF1. S-allylcysteine inhibits TNF-α, IL-6, and myostatin. Tea polyphenols (epigallocatechin-3-gallate, epigallocatechin, epicatechin-3-gallate, epicatechin, gallocatechins, and gallocatechin gallate) decrease MuRF1, MAFbx, and myostatin. Finally, phenolic compounds from pomegranate inhibit oxidative stress, NF-κB, and the ubiquitin–proteasome system on top of activating Akt/mTOR signaling.

Conclusions: Inflammation is associated with muscle atrophy, chronic diseases, and aging. Food phytochemicals may be key to reducing the individual's inflammatory condition.

6.5. Decoding Nutritional Labels: Adolescents' Engagement with Nutritional Labels on Canned Juice Drinks in Taiwan

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The information provided by food labels is essential for health risk assessment, enabling consumers to make informed choices that help them maintain good health and reduce diet-related disease risks. This study, based on Schwartz's social–psychological model of knowledge, attitude, and behavior, explores how nutrition labeling on packaged juice drinks affects adolescents' knowledge, attitudes, and behaviors in Taiwan. Using a questionnaire survey method, data were collected from teenagers who had purchased packaged juice drinks from convenience stores in Taipei. The sample was analyzed with SPSS for Windows 26.0 using descriptive statistics, chi-square tests, independent sample *t*-tests, one-way ANOVA, and Scheffé post hoc comparisons. The findings reveal significant differences in knowledge, attitudes, and behaviors regarding food labeling among adolescents of different genders. A strong correlation was found between adolescents'

knowledge, attitudes, and behaviors toward juice drink labeling. Background variables significantly predicted these factors. These results suggest a critical role of gender and background in shaping adolescents' engagement with nutritional labels. Incorporating these insights into dietary education policies could enhance health education programs' effectiveness. Tailoring educational strategies to specific needs based on gender and background can improve health outcomes and encourage healthier dietary choices among adolescents. This highlights the importance of integrating comprehensive nutritional label education into school curriculums and public health initiatives to foster a well-informed younger generation capable of making better dietary decisions.

6.6. Future Trends and Challenges in Social Internet of Things (SIoT)

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The convergence of Social Internet of Things (SIoT) technologies and behavioral health strategies offers promising avenues for promoting healthier eating habits. The SIoT, which integrates social interactions with IoT, enables smart devices to communicate and collaborate in ways that simulate human social relationships. This emerging paradigm has the potential to transform dietary behaviors by leveraging personalized data, real-time feedback, and social influence mechanisms. Future trends in the SIoT could involve advanced systems that use edge computing and AI to provide tailored dietary recommendations, monitor nutritional intake, and foster community support for healthy eating. However, the implementation of the SIoT in promoting healthier eating faces several challenges, including data privacy concerns, the need for seamless interoperability among diverse devices, and the ethical considerations of using social data for behavior modification. This review explores the intersection of the SIoT and dietary behavior, addressing current advancements, evaluating the effectiveness of behavioral approaches supported by the SIoT, and identifying key obstacles that must be overcome to enhance the impact of these technologies on healthier eating practices. By examining these aspects, we aim to provide a nuanced understanding of how the SIoT can be leveraged to support better eating habits and contribute to overall public health improvements. The integration of smart devices, the Internet of Things (IoT), and social networking is poised to revolutionize healthcare by enhancing the efficiency and effectiveness of various applications and services. This transformation is further advanced by the emerging concept of the Social Internet of Things (SIoT), which merges social interactions with IoT. The SIoT represents a paradigm where objects, akin to humans, possess social attributes and engage in relationships to fulfill their needs, thereby improving performance and efficiency. This investigation underscores the importance of addressing these challenges to fully harness the potential of the SIoT in revolutionizing healthcare delivery.

6.7. Knowledge, Attitude and Practices (KAPs) of Selected Filipino Parents in Makati City on Sugar-Sweetened Beverages (SSBs)

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This study investigated parents' knowledge, attitudes, and practices (KAP) toward sugar-sweetened beverages (SSBs). A total of 168 respondents participated, predominantly mothers (73.21%). The statistical analysis used was Pearson correlation coefficients, which found a weak but statistically significant positive correlation (r = 0.1891, 0.0140) between monthly family income and the parents' knowledge on SSBs. Despite this, attitudes about reading labels were highly favorable across all income levels with an average attitude

score of 4.2 out of 5. However, age, educational attainment, and total monthly household income all have non-significant weak correlations with attitude. Meanwhile, educational attainment has a weak but statistically significant positive correlation with practices for reading food labels (r = 0.1898, p 0.1373). The most preferred SSBs were soft drinks, fruit juice, whole/full cream milk, chocolate drink, and yogurt drink. Notably, the frequency of purchasing yogurt drinks was negatively correlated with educational attainment (r = −0.1713, p = 0.2109). The purchase of chocolate drinks (powdered and liquid) showed a positive correlation with monthly household income (r = 0.2147, p = 0.0051), while soft drink purchases were negatively correlated with monthly household income (r = −0.1740, p = 0.2409). Some parents had misconceptions about energy drinks. Overall, the findings indicate a need for focused interventions to increase parental understanding and practices regarding SSBs, particularly among low-income households, to encourage healthier beverage choices for children.

6.8. Lifestyle and Behavioral Changes: A Pathway to Weight Reduction and Pain Management in Overweight and Obese Women

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Introduction: The cause of weight gain is multidimensional ranging from dietary habits, physical activity levels, sleep patterns, and stress management and is associated directly and indirectly with many physical ailments and chronic diseases. Hence, a multidimensional approach to weight loss is needed. Research has also shown that women are affected more compared to men. The present study aims to study the effect of lifestyle and behavior modification on the anthropometric measurements, physical ailments and chronic pain of overweight and obese women.

Methods: This record review study was conducted using the data of overweight and obese women who participated in a 3-month nutritionist-led online weight loss program in the year 2023. This program focusses on early sleep, early wake up, better mastication behavior, caloric restriction, breathwork, strength training and stress management along with online yoga sessions thrice a week.

Results: In total, 45 women participated in the program and the data of 22 participants were available for analysis. The mean weight of the subjects at baseline was 78.10 ± 10.85 kg, which reduced in the 1st month to 74.52 ± 10.72, then gradually to 71.91 ± 10.89 kg by the end of the 2nd month and reached 69.61 ± 10.41 kg by the end of the 3rd month. In the 3-month period, all study participants lost more than 5% of total body weight with a 3.42 kg/m^2 (SD, ±0.88) reduction in body mass index (BMI). Statistically significant changes were found for the selected girth measurements. The number of ailments and chronic pain reduced from 15.59 ± 9.18 at baseline to 5.95 ± 4.37 (p 0.01) at the end of 3 months.

Conclusions: The study concludes that a lifestyle and behavior modification-based weight loss program significantly improves the weight, BMI, girth measurements and the physical ailments and chronic pain of overweight and obese women.

6.9. Unveiling Consumer Preferences for Whole-Wheat and White Bread in Kosovo

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Introduction: Bread is a staple food in Kosovo. Understanding consumer preferences for bread made from locally sourced whole wheat versus endosperm (white) flour can provide valuable insights into dietary choices and nutrient intake. This study investigated the consumer evaluation of bread prepared from commercially available whole wheat and endosperm flours typical of the Kosovar market.

Methodology: A sensory evaluation was conducted with 50 consumers who assessed key attributes of bread samples prepared from both white and integral flour types. These attributes included color, shape, texture, and overall acceptability. Evaluation was based on a 5-point scale where 1 indicated "strongly dislike" and 5 indicated "strongly like". Data analysis was performed using SPSS software (https://www.ibm.com/spss, accessed on 1 November 2024).

Results: The sensory evaluation revealed a general consumer preference for white bread (76%) over whole-wheat bread (24%). This inclination might be attributable to several factors, such as the lighter color and perceived softer texture of endosperm bread. Additionally, a lack of awareness regarding the health benefits of whole wheat compared to endosperm flour could be a contributing factor.

Conclusions: Our findings suggest a stronger consumer preference for endosperm bread in Kosovo compared to whole-wheat bread made from locally sourced flours. Further research is warranted to delve deeper into the reasons behind this preference, including potential knowledge gaps regarding the importance of whole grains for health. Exploring strategies to educate consumers about the nutritional advantages of whole-wheat bread could be valuable in promoting healthier dietary choices among Kosovar consumers.

7. Session 6: Nutrition Across the Lifespan

7.1. Biological Value of Plant-Based Proteins for Children and Adolescent Development: A Review

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In personalized nutrition, we must develop dietary recommendations adapted to the specific needs humans undergo at each stage of their growth and development, considering their nutritional, health and inflammatory status, for example, chronic diseases that begin even during gestation, like cystic fibrosis. The main aim of this study was to review the current findings on the biological value of plant-based protein sources on the growth and development of children and adolescents. We conducted a literature review of articles published between January 2019 and June 2024 using electronic databases (PubMed and Google Scholar) for all publications available in English. Adequate daily protein intake in children under 19 years is crucial for their growth and development. However, in childhood, a diet very high in protein could accelerate growth and increase the risk of overweight and obesity in childhood and later on. Compared to animal-based proteins (ABPs), a PBP diet is associated with increased risks of nutrient deficiencies, especially in vulnerable groups, such as pregnant and lactating women, infants, children, adolescents, and older. Even though switching to plant-based diets is recommended to reduce the environmental burden related to livestock farming globally, it is essential to ensure an adequate amount of protein depending on each individual's characteristics, that is, age, sex, health status, illness, sociocultural factors, etc., ensuring that they receive the nine essential amino acids and appropriate supplementation with vitamins and minerals according to if they are on an ABP, PBP or mixed diet

7.2. Interplay Between APOE and TFAM Genotypes, Adiposity, and Microbiota: Implications for Metabolic Health and Neurodegenerative Disease Risk

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The interplay between genetic factors, mitochondrial function, adiposity, and the gut microbiota has garnered significant attention in recent years due to its implications for metabolic health and disease risk. One such genetic factor of interest is the apolipoprotein E (APOE) gene with the APOE4 allele being associated with a higher risk of neurodegenerative diseases and altered metabolic profiles. Additionally, mitochondrial transcription factor A (TFAM) plays a crucial role in maintaining mitochondrial DNA integrity and function, which are essential for cellular energy metabolism.

Our results reveal that individuals carrying the APOE4 allele exhibited a distinct microbial profile characterized by an enrichment of *Barnesiella* spp., *Ruminococcus*, and *Verrucomicrobia* taxa. The enrichment of these taxa in individuals with the APOE4 allele may reflect alterations in carbohydrate metabolism, SCFA production, or mucin turnover within the gut ecosystem. TFAM rs1937 was found to correlate with adiposity, suggesting a potential link between mitochondrial function and adipose tissue metabolism. *Ruminococcaceae* UCG-014, likely associated with fiber fermentation and short-chain fatty acid production, exhibited varying abundances across different TFAM genotypes. We also found differences in *Sutterella*, a member of the *Alcaligenaceae* family, indicating its potential involvement in gastrointestinal disorders and inflammatory bowel diseases. Additionally, the presence of the *Eubacterium coprostanoligenes* group, implicated in esterols metabolism, was also detected.

By addressing adiposity and microbiota composition in conjunction with genetic factors like APOE4 and TFAM, novel mechanisms can be elucidated in order to optimize metabolic health, enhance longevity, and reduce the burden of age-related diseases. These approaches represent a promising frontier in precision medicine and personalized healthcare.

7.3. A Fiber- and Polyphenol-Enriched Diet Modulates Gut Microbiota Composition in Healthy Rats

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Introduction and objectives

The Mediterranean diet is abundant in bioactive components such as fiber and polyphenols. Some of these components have shown their ability to modulate the immune system and microbiota composition.

The goal of this study was to investigate the impact of a diet rich in polyphenols and fiber on the intestinal barrier and gut microbiota.

Materials and methods

Seven-week-old Wistar rats were fed either a standard diet (REF group) or a diet enriched in fiber (9%) and polyphenols (0.5%) (FPD group) for 9 weeks. Body weight and feed and water consumption were monitored throughout the study period. At the end, intestinal tissue was collected for a histological study, and contents from both the cecum and small intestine were obtained for a microbiota study. In this study, diversity and taxonomy were evaluated by massive sequencing of the 16S ribosomal RNA gene.

Results and discussions

After 9 weeks of intervention, no significant changes were found in the histological structure of the small intestine. However, in cecal content, the FPD group had higher bacterial α- and β-diversity than the REF group. Additionally, the FPD group showed a different taxonomic profile. As example, the relative abundances of the *Bacteroides* and *Breznakia* genera increased, whereas those of *Streptococcus* and *Lactococcus* decreased. In the case of small intestine content, there were no differences in microbiota diversity, but some differences at the taxonomic level also appeared. The differences in α- and β-diversity and in bacteria profile found between the compartments were more evident in the FPD group.

Conclusions

In conclusion, although a fiber- and polyphenol-enriched diet does not change the structure of the small intestine, it modulates bacterial gut microbiota composition. Further studies will be focused on the function of the intestinal microbiota and its implications on health.

7.4. Nutritional Analysis and Sensory Evaluation of Formulated Infant Cereal from Guinea Corn, Crayfish and Carot

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INTRODUCTION: Infant nutrition stands at the forefront of public health priorities, and nutritional choices made during transition from exclusive breastfeeding to complementary feeding are central to shaping infants' overall health and resilience to diseases. Consequently, there is a growing emphasis on formulating complementary foods that not only meet the energy requirements of infants but also provide a spectrum of essential nutrients such as protein, vitamins and minerals crucial for their optimal growth and development.

METHODS: Infant cereal was formulated using guinea corn (energy), crayfish (protein source) and carrot (vitamins) at different proportions, which were denoted as samples A (Guinea corn 75%, Crayfish 5%, Carrot 20%), B (Guinea corn 75%, Crayfish 10%, Carrot 15%), and C (Guinea corn 75%, Crayfish 15%, Carrot 10%). Sensory evaluation was carried out among mothers using a 9-point Likert scale. Data analysis was carried out using SPSS V26.

RESULTS: Proximate analysis revealed that there was no significant difference in the moisture content of the three samples, ranging from 3.17 ± 0.29% to 3.83 ± 0.29%. Sample C had significantly (p 0.05) higher protein content (27.67 ± 0.04%) and fat content (6.67 ± 0.58%) than the other samples. The fat content ranged from to 4.33 ± 0.58% to 6.67 ± 0.58%. There was a significant difference in the carbohydrate content of the samples (p 0.05). Sample A had the highest carbohydrate content (67.64 ± 1.10%), while C had the lowest carbohydrate content (57.87 ± 0.28%). The ash content of the samples was not significantly different, ranging between 3.03 ± 0.50% and 3.67 ± 0.29%. The beta-carotene contents of samples A (10.55 ± 0.06 mg/100 g) and B (10.72 ± 0.16 mg/100 g) were not significantly different ($p > 0.05$), while sample C had the lowest beta-carotene content (9.06 ± 0.14

mg/100 g). Sample A was most preferred by the mothers in terms of color, aroma and taste, while sample C was the most disliked.

CONCLUSION: The formulated infant cereal was nutrient-dense and highly acceptable by mothers. However, sample C, with a higher percentage of crayfish, was the most disliked by mothers.

7.5. Nutritional Supplement Potential of Cyperus rotundus for Metabolic Syndrome

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This study explores the anti-inflammatory and hypolipidemic properties of *Cyperus rotundus* through an in-depth analysis of its phytocompounds and their molecular interactions. Using in silico docking studies, the active phytocompounds of *Cyperus rotundus* were found to interact effectively with key inflammatory cytokines, tumor necrosis factor-alpha (TNF-α) and interferon-gamma (IFN-γ). These interactions suggest a potential mechanism for the anti-inflammatory effects observed.

Further analysis demonstrated that these phytocompounds significantly downregulated the mRNA expression levels of cyclooxygenase-2 (COX-2) in both adipose and inflamed tissues. COX-2 is a crucial enzyme involved in the inflammatory pathway, and its suppression indicates a strong anti-inflammatory response.

Histopathological examinations provided additional evidence supporting the hypolipidemic effect of *Cyperus rotundus*. The histological analysis of liver tissue revealed a marked reduction in the size of adipose cells, indicating a decrease in adipose tissue mass.

The findings of this study suggest that *Cyperus rotundus* exerts significant anti-inflammatory and hypolipidemic effects. The phytocompounds interact with TNF-α and IFN-γ, leading to the downregulation of COX-2 mRNA expression and reduction in adipose tissue size. These results highlight the potential of *Cyperus rotundus* as a therapeutic agent for managing inflammation and obesity-related conditions.

7.6. Psychological Status, Diet Quality, Level of Physical Activity, and Nutritional Status of Adolescent Online Gamers in a San Pablo City Science High School

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This study examines the correlation of online gaming on the psychological well-being, physical activity, nutritional status, and diet quality of adolescent student gamers aged 13–18 in a San Pablo City Science High School. With 171 randomly selected respondents, employing a descriptive, cross-sectional approach, this research gathered data on demographics, gaming preferences, physical activity, psychological well-being, diet quality, and BMI. Findings indicate that the majority of students spend 1–2 h of online gaming per day with a frequency of 7 times a week. Most exhibit high diet diversity, moderate physical activity level, normal nutritional status, and psychological status scores of 64–95. Furthermore, Spearman rho (ρ) coefficient values revealed negligible associations between gaming time and psychological status, physical activity, BMI, and diet quality. Similarly, there were no associations found between physical activity level and nutritional status and between psychological status and nutritional status. Overall, the findings suggest no clear monotonic associations between gaming time and the mentioned variables. Despite concerns, the majority of respondents demonstrated favorable psychological status, normal BMI, and varied diet, albeit they were lacking in nutrient-dense food groups. These results highlight the importance of studying the complex connections between online gaming and the well-being of adolescents, urging further research for a more detailed understanding

7.7. The Living History Connoisseur: An Unexpected Participant in the Gut Microbiome Puzzle

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Introduction: Fermented foods are known for their culinary importance in many cultures and have shown beneficial effects toward human health. Differences in microbial composition and metabolites in commercial and traditional fermented products have been found due to differences in production processes, and therefore traditional fermented products often exhibit a greater microbial diversity to the human gut. This study evaluated the consumption, eating patterns and frequency of fermented food products among individuals who self-identify as re-enactors or living history practitioners (LHPs).

Methods: The aim of this cross-sectional observational study was to evaluate if LHPs consume traditional fermented products as part of their diet. A Qualtrics survey was distributed to 311 LHPs, out of whom 77 respondents completed the survey. The questionnaire included questions regarding the frequency of consumption of traditional and conventional fermented foods as well as the types of products they consumed. The inclusion criteria for this study were individuals who self-identified as living history practitioners and were at least 18 years old. The data were analyzed using Qualtrics software (https://www.qualtrics.com/, accessed on 1 November 2024).

Results: The results of this study indicated that 69% of LHPs consumed traditional fermented products at least occasionally. In total, 68% of the participants were female. The consumption pattern revealed that middle-aged and older LHPs consumed more traditional products compared to younger LHPs. To our knowledge, this is the first study of this kind, and the most commonly consumed products were found to be traditional fermented vegetables, traditional fermented grains, fruits and traditional fermented milk products.

Conclusions: LHPs are a unique Western cohort to study the effects of traditional fermented products on the gut microbiome.

7.8. The Maternal Diet During Pre-Gestation, Gestation, or Lactation Impacts Differently on Intestinal Gene Expression: The Role of Fiber and Polyphenols

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Diet composition is important for health, especially during critical periods such as pre-gestation (P), gestation (G), or lactation (L), due to its potential impact on both the mother and the offspring. The Mediterranean diet includes many healthy foods such as whole grains, fruits, vegetables, beans, and nuts, all of them rich in fiber and polyphenols.

The present preclinical study assesses the impact on intestinal gene expression of a diet rich in fiber and polyphenols (HFP diet) during those periods, which, in rats, correspond to 3 weeks each (P, G, or L). Gene expression analysis was performed at the end of lactation using mRNA two-step PCR amplification with random primers and poly-T, which was followed by library generation and HiSeq X-Ten Illumina sequencing (Seeqplexing).

The results showed a broad number of genes significantly modulated after the HFP diet compared to a reference diet with higher number of genes modulated when the supplementing period was closer to the analysis day (L > G > P). Notably, genes involved in immune signaling, intestinal absorption, and cell growth were among those significantly affected by the HFP dietary intervention. A diet effect on the expression of key genes such as ferritin, apelin, fibroblast growth factor (FGF)-12, interleukin (IL)-17, and complement

proteins, among others, was also found. There was also a unique gene modified in all the intervention periods (Family with Sequence Similarity 17 Member A—FAM17A—which codifies a protein with unknown function), indicating that this molecule may participate in the effects induced by fiber and polyphenols.

Overall, the influence of diet during a 3-week period (P, G, or L) in rats is able to modulate the intestinal gene expression, and, consequently, maternal health, which can ultimately have an indirect impact on the offspring.

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