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TECHNICAL DATA SHEET



GBX FIT™

The world's first QUADbiotic formula in a convenient & cool purple pill that targets the gut microbiome for healthy weight loss.

KEY INGREDIENTS

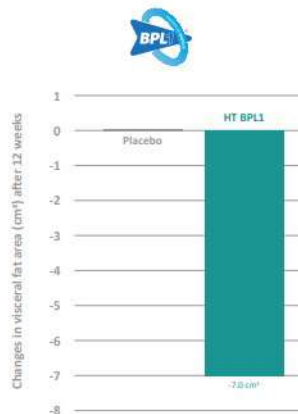
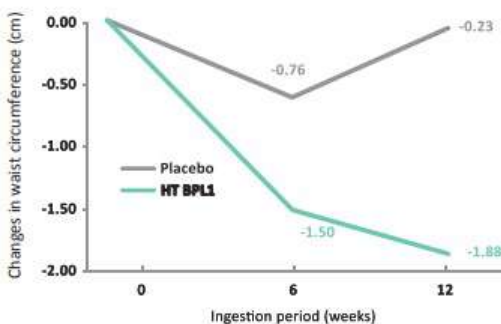
Bifidobacterium Lactis: 1. (Postbiotics HT BPL1) – HT-BPL1 is a vegan heat treated postbiotic, scientifically proven to aid in weight management and support metabolic health. Studies have shown this powerful ingredient reduces visceral fat and cholesterol levels, whilst containing strong anti-inflammatory properties.

In a human clinical study of abdominally obese men and women, HT BPL1 resulted in a **significant decrease of waist circumference** compared to the placebo after **ONLY 12 weeks**.⁵

39% of study subjects in the HT BPL1 intervention group experienced a decreased waist circumference of 2cm or more at 12 weeks.⁶

After **ONLY 12 weeks**, subjects in the HT BPL1 intervention group showed a significant reduction in abdominal visceral fat area, compared to baseline.

Overall, 55% of participants taking HT BPL1 saw a reduction in visceral fat area.⁶



Studies show (as seen below) that certain probiotics that are dead also carry nutrients that carry health benefits – in this case weight loss/management. Based on the clinical studies, after 3 months of use, subjects who received BPL1 experienced significant reductions in waist circumference and abdominal visceral fat compared to placebo. Waist reductions of 1.75cm and 1.9cm were seen in the heat killed BPL1. There is a synergistic effect when combining functional fibers like Invavea with BPL1 where there was a 35% reduction in visceral fat, as compared to declines of 18.7% and 12.7% which is 3.5lbs per 10lbs of visceral fat. (Which is why we use this fiber in combination with BPL1 as discussed below and Sunfiber, Bimuno, Isofiber in other Amare products.)

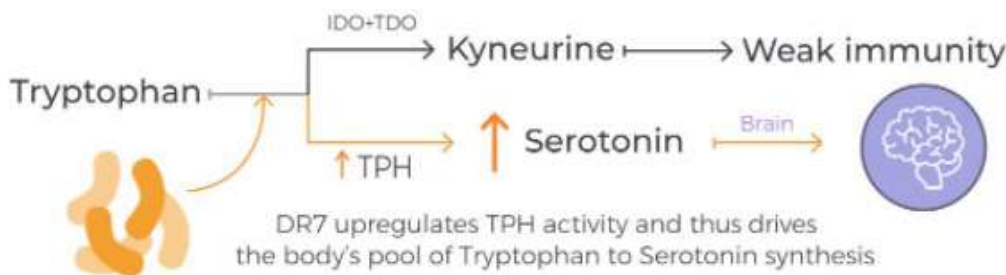
Lactobacillus Plantarum DR7 – A Probiotic that works via the gut-brain axis and is shown to optimize the serotonin pathway and gut modulation where it influences the norepinephrine pathway with increased dopamine levels. The importance of tryptophan-serotonin modulation could be one of several mechanisms involved demonstrating that DR7 lowers symptoms of stress and anxiety, as well as biomarker cortisol.

DR7 & Stress - Benefits on the human body

- **Stress** is a feeling of emotional or physical tension caused by an existing stress-causing factor.
- **Anxiety** is stress that continues after the stressor is gone.

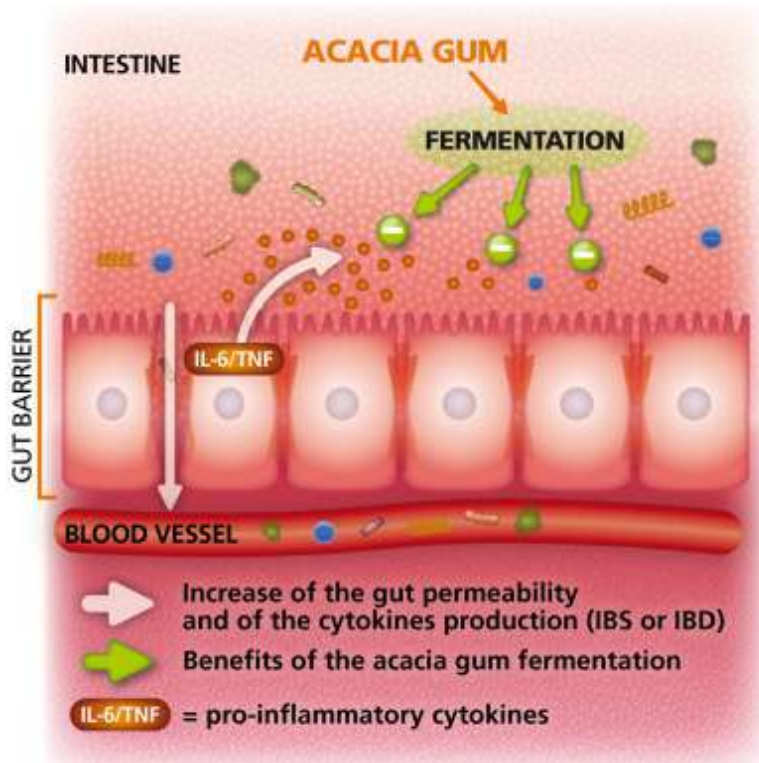
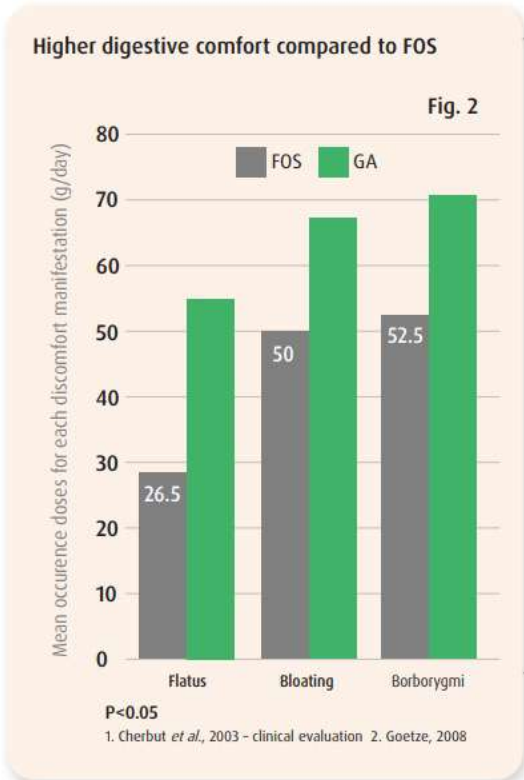
Chronic stress puts you at risk for health problems:

- Hypertension
- Heart disease
- Diabetes
- Obesity
- Depression
- Skin problems
- Menstrual problems



Acacia Gum – is an all-natural, organic and GMO-free prebiotic ingredient sourced from carefully selected acacia trees in Africa. It offers a unique sustainable commitment and delivers fiber enrichment that helps foster the flourishing of probiotics in the microbiome. This is an ideal clean label ingredient for fiber fortification and prebiotic claims. Prebiotic effect of acacia fiber has been largely demonstrated for 40 years in more than 40 studies that have shown profound synergistic effects with specific bacterial strains, like the above BPL1. It is FODMAP friendly, and has a carbon neutral footprint. Previous studies have demonstrated that inavea helps to restore the gut barrier and improve gut diversity through the mechanism of providing probiotics fuel. (probiotics feed probiotics)

Rich in soluble fiber, acacia fiber is sourced from the sap of the Acacia Senegal tree, a plant native to parts of Africa, Pakistan, and India. Also known as gum arabic and acacia fiber, acacia gum is also a prebiotic that can stimulate the growth of beneficial bacteria in the intestines. It is also associated in studies to increase satiety and lowering peak blood glucose response in healthy human subjects.

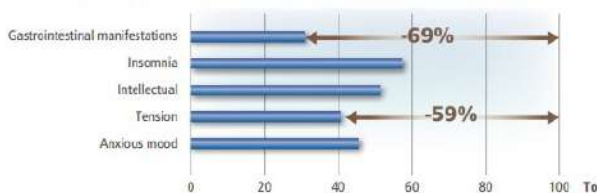


The sourcing of our acacia gum has been increasingly more sustainable for over 50 years in France. We have been recognized in France with NGO, SOS SAHEL, and the preservation of acacia forests for the environment.

Sweet Orange Peel Extract – This organic sweet orange peel (*Citrus sinensis* (L.) Osbeck) extract sourced from Costa Rica contains beneficial compounds derived from plant sources called Phytobiotics. This specific compound regulates stress through the dopamine and adenosine pathways. This ingredient is shown to reduce by 50% the feelings of stress, 53% of global stress and inhibits the stress response receptors in human beings. With stress being the #1 factor in cortisol and obesity, modulating these pathways is a key contributor to overall mental wellness and weight management.

- **Significant reduction of subjective feeling of stress** as demonstrated by the HAM-A questionnaire:

SIGNIFICANT DECREASE OF STRESS MANIFESTATIONS



CLINICAL STUDIES

Lipoteichoic acid from *Bifidobacterium animalis* subsp. *lactis* BPL1: a novel postbiotic that reduces fat deposition via IGF-1 pathway

Ferran Balaguer, María Enrique, Silvia Llopis, Marta Barrena, Verónica Navarro, Beatriz Álvarez, Empar Chenoll, Daniel Ramón, Marta Tortajada, Patricia Martorell

First published: 23 February 2021 <https://doi.org/10.1111/1751-7915.13769> Citations: 2

Summary

Obesity and its related metabolic disorders, such as diabetes and cardiovascular disease, are major risk factors for morbidity and mortality in the world population. In this context, supplementation with the probiotic strain *Bifidobacterium animalis* subsp. *lactis* BPL1 (CECT8145) has been shown to ameliorate obesity biomarkers. Analyzing the basis of this observation and using the pre-clinical model *Caenorhabditis elegans*, we have found that lipoteichoic acid (LTA) of BPL1 is responsible for its fat-reducing properties and that this attribute is preserved under hyperglycaemic conditions. This fat-reducing capacity of both BPL1 and LTA-BPL1 is abolished under glucose restriction, as a result of changes in LTA chemical composition. Moreover, we have demonstrated that LTA exerts this function through the IGF-1 pathway, as does BPL1 strain. These results open the possibility of using LTA as a novel postbiotic, whose beneficial properties can be applied therapeutically and/or preventively in metabolic syndrome and diabetes-related disorders.

An Infant Milk Formula Supplemented with Heat-Treated Probiotic *Bifidobacterium animalis* subsp. *lactis* CECT 8145, Reduces Fat Deposition in *C. elegans* and Augments Acetate and Lactate in a Fermented Infant Slurry

by Ángela Silva 1,†, Nuria Gonzalez 1,†, Ana Terrén 2, Antonio García 2,3,4, Juan Francisco Martínez-Blanch 5, Vanessa Illescas 5, Javier Morales 6, Marcos Maroto 2, Salvador Genovés 1, Daniel Ramón 1,5, Patricia Martorell 1 and Empar Chenoll 1,5,*ORCID

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Abstract

Pediatric obesity has a growing health and socio-economical impact due to cardiovascular and metabolic complications in adult life. Some recent studies suggest that live or heat-treated probiotics have beneficial effects in preventing fat deposition and obesity in preclinical and clinical sets. Here, we have explored the effects of heat-treated probiotic *Bifidobacterium animalis* subsp. *lactis* CECT 8145 (HT-BPL1), added as a supplement on an infant milk formula (HT-BPL1-IN), on *Caenorhabditis elegans* fat deposition and short-chain fatty acids (SCFAs) and lactate, using fermented baby fecal slurries. We have found that HT-BPL1-IN significantly reduced fat deposition in *C. elegans*, at the time it drastically augmented the generation of some SCFAs, particularly acetate and organic acid lactate. Data suggest that heat-treated BPL1 maintains its functional activities when added to an infant powder milk formula.

Lactobacillus plantarum DR7 alleviates stress and anxiety in adults: a randomized, double-blind, placebo-controlled study

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Abstract

Probiotics have been reported to exert beneficial effects along the gut-brain axis. This randomised, double-blind and placebo-controlled human study aimed to evaluate such properties of *Lactobacillus plantarum* DR7 and its accompanying mechanisms in stressed adults. One hundred and eleven (n=111; DR7 n=56, placebo n=55) stressed adults were recruited based on moderate stress levels using the PSS-10 questionnaire. The consumption of DR7 (1×10⁹ cfu/day) for 12 weeks reduced symptoms of stress (P=0.024), anxiety (P=0.001), and total psychological scores (P=0.022) as early as 8 weeks among stressed adults compared to the placebo group as assessed by the DASS-42 questionnaire. Plasma cortisol level was reduced among DR7 subjects as compared to the placebo, accompanied by reduced plasma pro-inflammatory cytokines, such as interferon- γ and transforming growth factor- β and increased plasma anti-inflammatory cytokines, such as interleukin 10 (P<0.05). DR7 better improved cognitive and memory functions in normal adults (>30 years old), such as basic attention, emotional cognition, and associate learning (P<0.05), as compared to the placebo and young adults (<30 years old). The administration of DR7 enhanced the serotonin pathway, as observed by lowered expressions of plasma dopamine β -hydroxylase (DBH), tyrosine hydroxylase (TH), indoleamine 2,3-dioxygenase and tryptophan 2,3-dioxygenase accompanied by increased expressions of tryptophan hydroxylase-2 and 5-hydroxytryptamine receptor-6, while stabilising the dopamine pathway as observed via stabilized expressions of TH and DBH over 12 weeks as compared to the placebo (P<0.05). Our results indicated that DR7 fulfil the requirement of a probiotic strain as per recommendation of FAO/WHO and could be applicable as a natural strategy to improve psychological functions, cognitive health and memory in stressed adults.

Lactobacillus plantarum DR7 Modulated Bowel Movement and Gut Microbiota Associated with Dopamine and Serotonin Pathways in Stressed Adults

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Affiliations expand

PMID: 32610495 PMCID: PMC7370301 DOI: 10.3390/ijms21134608

Free PMC article

Abstract

We have previously reported that the administration of *Lactobacillus plantarum* DR7 for 12 weeks reduced stress and anxiety in stressed adults as compared to the placebo group, in association with changes along the brain neurotransmitters pathways of serotonin and dopamine-norepinephrine. We now aim to evaluate the effects of DR7 on gut functions, gut microbiota compositional changes, and determine the correlations between microbiota changes and the pathways of brain neurotransmitters. The administration of DR7 prevented an increase of defecation frequency over 12 weeks as compared to the placebo ($p = 0.044$), modulating the increase of stress-induced bowel movement. Over 12 weeks, alpha diversity of gut microbiota was higher in DR7 than the placebo group across class ($p = 0.005$) and order ($p = 0.018$) levels, while beta diversity differed between groups at class and order levels ($p < 0.001$). Differences in specific bacterial groups were identified, showing consistency at different taxonomic levels that survived multiplicity correction, along the phyla of Bacteroides and Firmicutes and along the classes of Deltaproteobacteria and Actinobacteria. Bacteroidetes, Bacteroidia, and Bacteroidales which were reduced in abundance in the placebo group showed opposing correlation with gene expression of dopamine beta hydroxylase (DBH, dopamine pathway; $p < 0.001$), while Bacteroidia and Bacteroidales showed correlation with tryptophan hydroxylase-II (TPH2, serotonin pathway; $p = 0.001$). A correlation was observed between DBH and Firmicutes ($p = 0.002$), Clostridia ($p < 0.001$), Clostridiales ($p = 0.001$), Blautia ($p < 0.001$), and Romboutsia ($p < 0.001$), which were increased in abundance in the placebo group. Blautia was also associated with TDO ($p = 0.001$), whereas Romboutsia had an opposing correlation with TPH2 ($p < 0.001$). Deltaproteobacteria and Desulfovibrionales which were decreased in abundance in the placebo group showed opposing correlation with DBH ($p = 0.001$), whereas Bilophila was associated with TPH2 ($p = 0.001$). Our present data showed that physiological changes induced by *L. plantarum* DR7 could be associated with changes in specific taxa of the gut microbiota along the serotonin and dopamine pathways.

Lactobacillus plantarum DR7 improved brain health in aging rats via the serotonin, inflammatory and apoptosis pathways

Authors: Zaydi, A.I. 1 ; Lew, L.-C. 1 ; Hor, Y.-Y. 1 ; Jaafar, M.H. 1 ; Chuah, L.-O. 1 ; Yap, K.-P. 2 ; Azlan, A. 3 ; Azzam, G. 3 ; Liong, M.-T. 1 ;

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DOI: <https://doi.org/10.3920/BM2019.0200>

Aging processes affect the brain in many ways, ranging from cellular to functional levels which lead to cognitive decline and increased oxidative stress. The aim of this study was to investigate the potentials of *Lactobacillus plantarum* DR7 on brain health including cognitive and memory functions during aging and the impacts of high fat diet during a 12-week period. Male Sprague-Dawley rats were separated into six groups: (1) young animals on normal diet (ND), (2) young animals on a high fat diet (HFD), (3) aged animals on ND, (4) aged animals on HFD, (5) aged animals on HFD and *L. plantarum* DR7 (109 cfu/day) and (6) aged animals receiving HFD and lovastatin. To induce ageing, all rats in group 3 to 6 were injected sub-cutaneously at 600 mg/kg/day of D-galactose daily. The administration of DR7 has reduced anxiety accompanied by enhanced memory during behavioural assessments in aged-HFD rats ($P < 0.05$). Hippocampal concentration of all three pro-inflammatory cytokines were increased during aging but reduced upon administration of both statin and DR7. Expressions of hippocampal neurotransmitters and apoptosis genes showed reduced expressions of indoleamine dioxygenase and P53 accompanied by increased expression of TPH1 in aged-HFD rats administered with DR7, indicating potential effects of DR7 along the pathways of serotonin and oxidative senescence. This study provided an insight into potentials of *L. plantarum* DR7 as a prospective dietary strategy to improve cognitive functions during aging. This study provided an insight into potentials of *L. plantarum* DR7 as a prospective dietary strategy to improve cognitive functions during aging.

Randomized Controlled Trial Nutrients

2021 Feb 14;13(2):618. doi: 10.3390/nu13020618.

Acacia Gum Is Well Tolerated While Increasing Satiety and Lowering Peak Blood Glucose Response in Healthy Human Subjects

Riley Larson 1, Courtney Nelson 1, Renee Korczak 1, Holly Willis 1, Jennifer Erickson 1, Qi Wang 2, Joanne Slavin 1

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PMID: 33672963 PMCID: PMC7918852 DOI: 10.3390/nu13020618

[Free PMC article](#)

Abstract

Acacia gum (AG) is a non-viscous soluble fiber that is easily incorporated into beverages and foods. To determine its physiological effects in healthy human subjects, we fed 0, 20, and 40 g of acacia gum in orange juice along with a bagel and cream cheese after a 12 h fast and compared satiety, glycemic response, gastrointestinal tolerance, and food intake among treatments. Subjects (n = 48) reported less hunger and greater fullness at 15 min (p = 0.019 and 0.003, respectively) and 240 min (p = 0.036 and 0.05, respectively) after breakfast with the 40 g fiber treatment. They also reported being more satisfied at 15 min (p = 0.011) and less hungry with the 40 g fiber treatment at 30 min (p = 0.012). Subjects reported more bloating, flatulence, and GI rumbling on the 40 g fiber treatment compared to control, although values for GI tolerance were all low with AG treatment. No significant differences were found in area under the curve (AUC) or change from baseline for blood glucose response, although actual blood glucose with 20 g fiber at 30 min was significantly less than control. Individuals varied greatly in their postprandial glucose response to all treatments. AG improves satiety response and may lower peak glucose response at certain timepoints, and it is well tolerated in healthy human subjects. AG can be added to beverages and foods in doses that can help meet fiber recommendations.

Pharmacological benefits of Acacia against metabolic diseases: intestinal-level bioactivities and favorable modulation of gut microbiota

Manas Ranjan Saha & Priyankar Dey (2021) Pharmacological benefits of Acacia against metabolic diseases: intestinal-level bioactivities and favorable modulation of gut microbiota, Archives of Physiology and Biochemistry, DOI: 10.1080/13813455.2021.1966475

Abstract

Context

Obesity-associated chronic metabolic disease is a leading contributor to mortality globally. Plants belonging to the genera Acacia are routinely used for the treatment of diverse metabolic diseases under different ethnomedicinal practices around the globe.

Objective

The current review centers around the pharmacological evidence of intestinal-level mechanisms for metabolic health benefits by Acacia spp.

Results

Acacia spp. increase the proportions of gut commensals (Bifidobacterium and Lactobacillus) and reduces the population of opportunistic pathobionts (Escherichia coli and Clostridium). Acacia gum that is rich in fibre, can also be a source of prebiotics to improve gut health. The intestinal-level anti-inflammatory activities of Acacia are likely to contribute to improvements in gut barrier function that would prevent gut-to-systemic endotoxin translocation and limit “low-grade” inflammation associated with metabolic diseases.

Conclusion

This comprehensive review for the first time has emphasised the intestinal-level benefits of Acacia spp. which could be instrumental in limiting the burden of metabolic disease.

Prospective evaluation of probiotic and prebiotic supplementation on diabetic health associated with gut microbiota

Author links open overlay panel Nazeha A. Khalilab Nehad R. Eltahanb Heba M. Elaktashb Samar Alyac Shahrul Razid Sarbinide
<https://doi.org/10.1016/j.fbio.2021.101149> Get rights and content

Abstract

Background

Gut microbiota are critical for proper metabolic functions. Gut health can often be improved with dietary modulation, especially with probiotic and prebiotic. These supplements can stimulate immune system responses and prevent colonization by pathogen. Many diseases, such as diabetes mellitus, heart diseases, obesity, and cancers, benefit from proper function of intestinal microflora. Diabetes is an endocrine disease typically controlled, at least in part, with dietary intervention.

Aims

The current study main aim was to study the potential health benefits of probiotic and prebiotic supplements on the treatment of diabetes.

Methods

Male rats were divided into negative and positive control groups. Additional groups were fed 5% of yogurt, gum Arabic or a combination. Total colonic microbiota, *Bifidobacterium* spp., *Lactobacillus* spp., and *Clostridium* spp., were counted. Blood glucose, lipid profiles, and kidney function, with histology, were analyzed.

Results

Gut microflora was significantly improved, especially in rats fed with pro/prebiotics. Serum lipid profiles significantly improved ($p \leq 0.05$) after feeding yogurt and gum Arabic in combination; HDL levels were significantly decreased ($p \leq 0.05$). Kidney function was also significantly enhanced ($p \leq 0.05$) after feeding with this mixture.

In conclusion

Yogurt and gum Arabic are highly recommended (level of 5%) for controlling diabetes and improvement of lipid, glucose, and kidney profiles; however, human trials are needed.

Gut Health-Promoting Benefits of a Dietary Supplement of Vitamins with Inulin and Acacia Fibers in Rats by Malén Massot-Cladera 1,2ORCID, Ignasi Azagra-Boronat 1,2ORCID, Àngels Franch 1,2ORCID, Margarida Castell 1,2ORCID, Maria J. Rodríguez-Lagunas 1,2ORCID and Francisco J. Pérez-Cano 1,2,*ORCID

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(This article belongs to the Special Issue Diet and Microbiome in Health and Aging)

Abstract

The study's objective was to ascertain whether a nutritional multivitamin and mineral supplement enriched with two different dietary fibers influences microbiota composition, mineral absorption, and some immune and metabolic biomarkers in adult rats. Nine-week-old Wistar rats were randomly assigned into four groups: the reference group; the group receiving a daily supplement based on a food matrix with proteins, vitamins, and minerals; and two other groups receiving this supplement enriched with inulin (V + I) or acacia (V + A) fiber for four weeks. Microbiota composition was determined in cecal content and mineral content in fecal, blood, and femur samples. Intestinal IgA concentration, hematological, and biochemical variables were evaluated. Both V + I and V + A supplementations increased Firmicutes and Actinobacteria phyla, which were associated with a higher presence of Lactobacillus and Bifidobacterium spp. V + A supplementation increased calcium, magnesium, phosphorus, and zinc concentrations in femur. V + I supplementation increased the fecal IgA content and reduced plasma total cholesterol and uric acid concentration. Both fiber-enriched supplements tested herein seem to be beneficial to gut-health, although differently.

The Effect of Gum Arabic (*Acacia senegal*) on Cardiovascular Risk Factors and Gastrointestinal Symptoms in Adults at Risk of Metabolic Syndrome: A Randomized Clinical Trial

by Amjad H. Jarrar ¹, Lily Stojanovska ^{1,2}, Vasso Apostolopoulos ²ORCID, Jack Feehan ^{2,3}ORCID, Mo'ath F. Bataineh ⁴, Leila Cheikh Ismail ^{5,6} and Ayesha S. Al Dhaheri ^{1,*}ORCID

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Abstract

Gum Arabic (GA) is a widely-used additive in food processing, but is also historically used in a number of traditional therapies. It has been shown to have a broad range of health benefits, particularly in improving important cardiovascular risk indicators. Metabolic syndrome and its associated cardiac outcomes are a significant burden on modern healthcare systems, and complementary interventions to aid in its management are required. We aimed to examine the effect of GA on those with, or at risk of, metabolic syndrome to identify an effect on improving important disease parameters related to cardiovascular outcomes. A single-blind, randomized, placebo-controlled trial was conducted to identify the effects of daily GA supplementation on metabolic and cardiovascular risk factors. A total of 80 participants were randomized to receive 20 g of GA daily (n = 40) or placebo (1 g pectin, n = 40) for 12 weeks. Key endpoints included body-anthropometric indices, diet and physical activity assessment, and blood chemistry (HbA1c, fasting glucose, and blood lipids). Of the 80 enrolled, 61 completed the study (intervention: 31, control: 30) with 19 dropping out due to poor treatment compliance. After 12 weeks, the participants receiving the GA showed significant decreases in systolic and diastolic blood pressure, fat-free body mass, energy and carbohydrate consumption, and fasting plasma glucose, as well as increased intake of dietary fiber. They also reported improvements in self-perceived bloating and quality of bowel movements, as well as a decreased appetite score following GA consumption. These results suggest that GA could be a safe and beneficial adjunct to other treatments for those with, or at risk of, metabolic syndrome.

Effect of sweet orange aroma on experimental anxiety in humans

Tiago Costa Goes 1, Fabrício Dias Antunes, Pérciles Barreto Alves, Flavia Teixeira-Silva

Abstract

Objectives: The objective of this study was to evaluate the potential anxiolytic effect of sweet orange (*Citrus sinensis*) aroma in healthy volunteers submitted to an anxiogenic situation.

Design: Forty (40) male volunteers were allocated to five different groups for the inhalation of sweet orange essential oil (test aroma: 2.5, 5, or 10 drops), tea tree essential oil (control aroma: 2.5 drops), or water (nonaromatic control: 2.5 drops). Immediately after inhalation, each volunteer was submitted to a model of anxiety, the video-monitored version of the Stroop Color-Word Test (SCWT).

Outcome measures: Psychologic parameters (state-anxiety, subjective tension, tranquilization, and sedation) and physiologic parameters (heart rate and gastrocnemius electromyogram) were evaluated before the inhalation period and before, during, and after the SCWT.

Results: Unlike the control groups, the individuals exposed to the test aroma (2.5 and 10 drops) presented a lack of significant alterations ($p > 0.05$) in state-anxiety, subjective tension and tranquillity levels throughout the anxiogenic situation, revealing an anxiolytic activity of sweet orange essential oil. Physiologic alterations along the test were not prevented in any treatment group, as has previously been observed for diazepam.

Conclusions: Although more studies are needed to find out the clinical relevance of aromatherapy for anxiety disorders, the present results indicate an acute anxiolytic activity of sweet orange aroma, giving some scientific support to its use as a tranquilizer by aromatherapists.

OSH in Figures: Stress at Work – Facts and Figures

January 2009

Publisher: EU-OSHA

Milczarek, Malgorzata & Schneider, Elke & González, Eusebio. (2009). OSH in Figures: Stress at Work – Facts and Figures.

Work-related stress is one of the biggest health and safety challenges that we face in Europe. Stress is the second most frequently reported work-related health problem, affecting 22% of workers from the EU 27 (in 2005), and the number of people suffering from stress-related conditions caused or made worse by work is likely to increase. This report discusses the prevalence of stress and the trends in work-related stress in the Member States of the European Union (based on international and national data), identifying those groups particularly exposed to stress in their working lives, subdivided by age, gender, sector, occupation, and employment status. Areas for future research and action are also indicated.

Adenosine A2A Receptors in Psychopharmacology: Modulators of Behavior, Mood and Cognition

Hai-Ying Shen^{1,*} and Jiang-Fan Chen²

Abstract

The adenosine A2A receptor (A2AR) is in the center of a neuromodulatory network affecting a wide range of neuropsychiatric functions by interacting with and integrating several neurotransmitter systems, especially dopaminergic and glutamatergic neurotransmission. These interactions and integrations occur at multiple levels, including (1) direct receptor-receptor cross-talk at the cell membrane, (2) intracellular second messenger systems, (3) trans-synaptic actions via striatal collaterals or interneurons in the striatum, (4) and interactions at the network level of the basal ganglia. Consequently, A2ARs constitute a novel target to modulate various psychiatric conditions. In the present review we will first summarize the molecular interaction of adenosine receptors with other neurotransmitter systems and then discuss the potential applications of A2AR agonists and antagonists in physiological and pathophysiological conditions, such as psychostimulant action, drug addiction, anxiety, depression, schizophrenia and learning and memory.

Flavor components of monoterpenes in citrus essential oils enhance the release of monoamines from rat brain slices

Syuichi Fukumoto¹, Emi Sawasaki, Satoshi Okuyama, Yoshiaki Miyake, Hidehiko Yokogoshi

Abstract

Citrus essential oils have been utilized widely in traditional medicine, and there are various reports of actions such as effects on behavior and effects on pain stimulation response due to exposure. However, there are no reports concerning effects on neurotransmitters after ingestion,

and uptake within the brain. We used brain tissue slices to investigate the effect of compounds in lemon essential oil on monoamine release. We investigated R-limonene, gamma-terpinene and citral, major components of lemon essential oil; S-limonene, an isomer of R-limonene and metabolites of these compounds. The effect of each compound on monoamine release from brain tissue slices was found to be dose-dependent. R-Limonene and its S-isomer demonstrated differences with regard to monoamine release from brain tissue. S-Limonene and its metabolites were found to have a stronger effect than the R-isomer. Limonene metabolites taken up in vivo were also found to have a stronger effect on monoamine release than both the R-form and the S-form. In an investigation of dopamine release using stratum slices, terpinene and pinene demonstrated no clear differences in activity attributable to isomers. However, rho-cymene, a gamma-terpinene metabolite, was found to have a stronger effect than gamma-terpinene. These results suggest that the metabolites of these monoterpene compounds contained in citrus essential oils have a stronger effect on monoamine release from brain tissue than the monoterpene compounds themselves.

Anxiolytic-like effect of sweet orange aroma in Wistar rats

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Abstract

Aromatherapy is the use of essential oils as an alternative treatment for medical purposes. Despite the lack of sufficient scientific proof, it is considered a holistic complementary therapy employed to enhance comfort and decrease distress. Citrus fragrances have been particularly used by aromatherapists for the treatment of anxiety symptoms. Based on this claim, the present study investigated the effects of *Citrus sinensis* (sweet orange) essential oil on Wistar, male rats evaluated in the elevated plus-maze followed by the light/dark paradigm. The animals were exposed to the orange aroma (100, 200 or 400 microl) for 5 min while in a Plexiglas chamber and were then immediately submitted to the behavioural tests. At all doses, *C. sinensis* oil demonstrated anxiolytic activity in at least one of the tests and, at the highest dose, it presented significant effects in both animal models, as indicated by increased exploration of the open arms of the elevated plus-maze (time: $p=0.004$; entries: $p=0.044$) and of the lit chamber of the light/dark paradigm (time: $p=0.030$). In order to discard the possibility that this outcome was due to non-specific effects of any odour exposure, the behavioural response to *Melaleuca alternifolia* essential oil was also evaluated, using the same animal models, but no anxiolytic effects were observed. These results suggest an acute anxiolytic activity of sweet orange essence, giving some scientific support to its use as a tranquilizer by aromatherapists.