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nutrition EVIDENCE

ISSUE 7: MAY 2025

POLYPHENOLS

NED EXPERT REVIEWS

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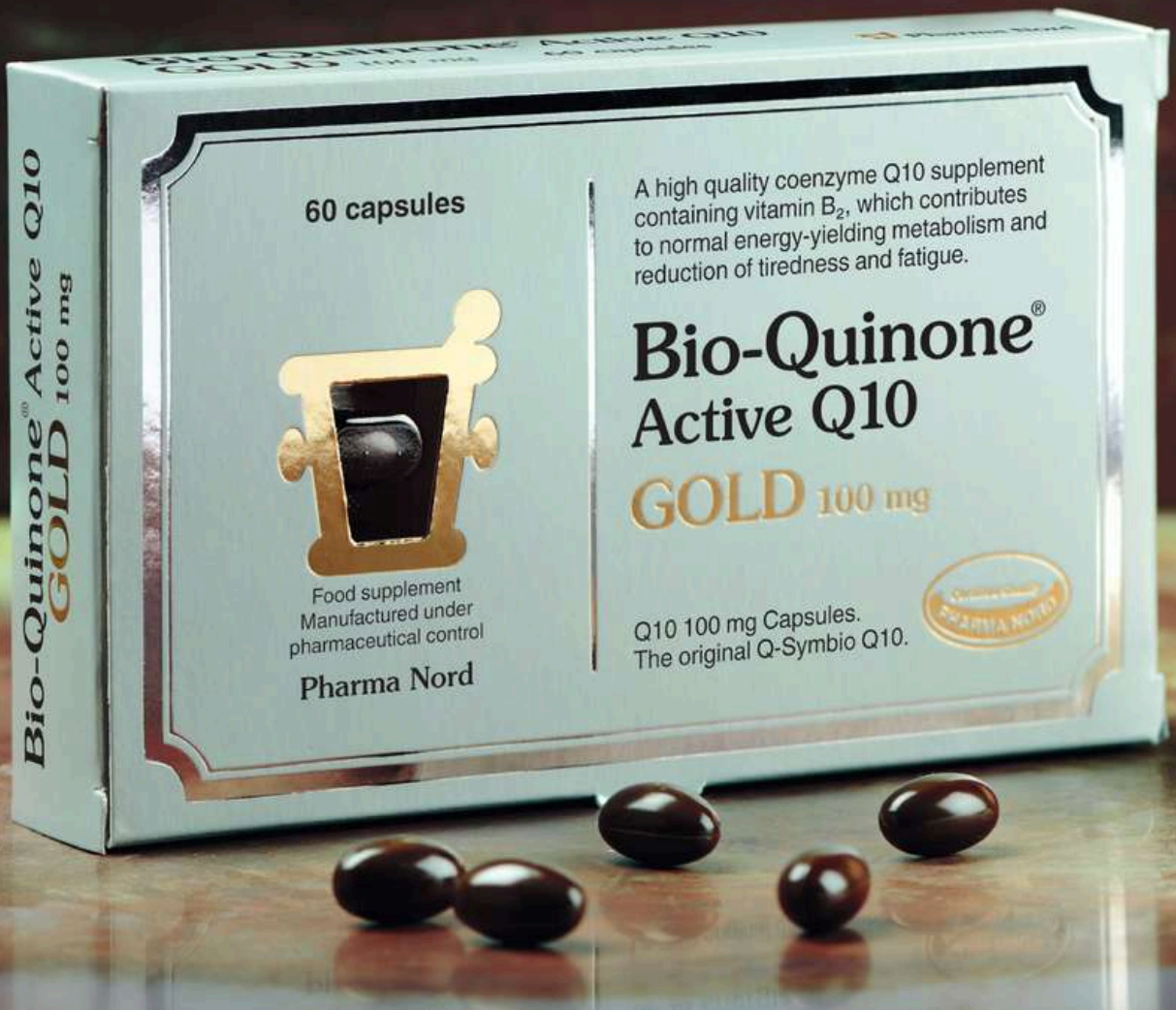

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WELCOME

Clare Grundel
Managing Editor

MAY IS FOR THE NED SCIENCE FORUM 2025

We are excited to bring you this edition of the NED Journal, focusing on the latest science on polyphenols and their wide-ranging impact on health and human physiology. Polyphenols are secondary metabolites, naturally occurring in plants, and further categorised into flavonoids, phenolic acids, stilbenes, lignans and others. With around 8,000 types of polyphenol reported in the literature, this edition of the NED Journal brings you a delightful amuse bouche to feed your mind and grace your table.

Polyphenols are the focus of the 2025 NED Science Forum at The Royal Society of Medicine in London. The published science on polyphenols will be put to battle and we will be sampling the delights of the haskap berry, mushroom coffee and oliphenolia. With over 4 hours of presentation, debate and networking with industry leaders, peers and sponsors, we will benefit from the wisdom of Professor Justin Roberts, Tanya Borowski, Ben Brown, Dr Michelle Barrow, Clare Grundel and others. If you are reading this before the 13 May 2025, you can get tickets here. If you missed the event, watch out for 2026 announcements!

With thanks to the expert reviewers who have written reviews for this edition and to the NED Editorial Board for their peer-review. Each review provides summary overviews of an article and clinical takeaways for you to apply to your own decision making with clients.

The British Association of Nutrition and Lifestyle Medicine (BANT) is a professional membership body for nutrition practitioners, trained in nutrition sciences and the delivery of personalised nutrition services. BANT members are reading and interpreting nutrition and lifestyle sciences such as that found in this NED Journal on a routine basis to inform their clinical decision making.
You can find the BANT member practitioner listing here.

The Nutrition Evidence Database is one of the ways that BANT contributes to the evidence-based practice of precision nutrition. BANT is delighted to make this resource open access for all and encourages all healthcare practitioners interested in personalised healthcare to make use of the resource on a regular basis. You can subscribe to receive monthly NED alerts here.

Read previous copies of the NED Journal here which BANT produces and makes available open access to all. BANT aims to bring good nutrition and lifestyle sciences to the forefront of healthcare and is able to do this through its ambition, careful management and the support of sponsors and advertisers. Thanks to the organisations who have supported this edition - **Nutri-Advanced (Metagenics), Pharma Nord, Pure Encapsulations, Vibrant Wellness and York Test.**

Jump into the rainbow world of polyphenols.

IN THIS ISSUE

ABOUT NUTRITION EVIDENCE (NED)

NUTRITION EVIDENCE DATABASE

Nutrition Evidence Database, known fondly as NED, is the UK's first scientific database of nutrition and lifestyle medicine research.
It focuses on high-quality, human research and other science-supported information and is designed as a comprehensive platform for practitioners, academic researchers and students.
The powerful, yet simple search functionality uses functional and lifestyle medicine filters to support evidence-based clinical decision making in personalised nutrition practice.

MEET THE NED EDITORIAL BOARD

EDITOR

Dr Michelle Barrow, BSc (Hons), MSc, QTLS, DProf, FBANT

Dr Barrow is the Academic Team Director and Clinical Director at CNELM. Michelle completed a Doctorate in Professional Studies (DProf) in 2019, titled "Leading transformation in Personalised Nutrition Practice". Her doctoral research included the construction of clinical tools to enable the development of a new evidence base for personalised nutrition practice in obesity management. She strives to develop the evidence base to support personalised nutrition practice through her academic work, research supervision, post-doctoral research, and publication. She is published in many scientific journals, including Autoimmunity Reviews, Nutrition Reviews and Current Research in Food and Nutrition.

Dr Michelle Barrow will be presenting at this year's NED Science Forum on the **Science and Art of Pathophysiological Reasoning** and as part of her presentation will be showcasing mechanism reviews and research papers from CNELM Graduates that support evidence-based personalised nutrition practice.

EDITORIAL TEAM

Dr Jessica Rigutto MPharm, MPH, Dr. sc. ETH Zurich, DipION, MBANT

External lecturer at the ETH Zürich, Switzerland. Specialised in micronutrient nutrition and nutrition methodology meta-research. Widely published in the peer-reviewed, scientific press.

Prof. Justin Roberts Editor-in-Chief, Ph.D, C.Sci, SFHEA, MBANT

Professor of Nutritional Physiology applied to exercise and functional health, Cambridge Centre for Sport and Exercise Sciences, Anglia Ruskin University.

Dr Kate Lawrence - Editor, BA(Hons), PhD, FHEA

Senior Lecturer in psychology at St Mary's University. Specialises in nutritional psychology and neurodiversity, with a focus on dietary and microbiome influences on mental health and cognition.

Clare Grundel, Managing Editor MSc, BA (Hons), MBANT

Science and Education Manager, BANT

Registered Nutritional Therapy Practitioner.

MEET THE NED EXPERT REVIEWERS

Our Expert Reviewers work within the nutrition industry in academia, research, clinical practice and wider healthcare, and provide unique and invaluable insights on the latest nutrition research to enable practitioners to apply the science to clinical practice.

Knowledge sharing is a key strategic pillar for the NED editorial team. Not only do the expert reviews get directly published on the NED database, they are further communicated via a series of monthly resources and across our BANT social media channels reaching in excess of 25,000 practitioners and followers.

EXPERT REVIEWERS IN THIS ISSUE

(In order of appearance)

Karin Elgar PhD

Following the completion of a PhD in Physiology and a career in the pharmaceutical industry, Karin graduated as a nutritional therapist from the Institute of Optimum Nutrition in 2004. She has since been practising in the Greater Manchester area, specialising in women's health and autoimmunity. Karin has written a number of literature reviews and carried out a variety of research and editing projects. She has also delivered CPD seminars and webinars on various topics.

Ana-Paula Agrela MSc

Ana is a Nutrition Consultant, and Health Coach who graduated with a BSc. (Hons) in Nutritional Science from Middlesex University and holds a Health Coaching certificate from Zest for Life. She completed her Master's degree in Holistic Health and Nutritional Education through Hawthorn University in the United States. Ana has over 20 years' experience in researching and developing health supplements for the nutraceutical industry. She also offers group education programs and private consultations to help clients make healthier food choices and lifestyle habits.

Dr Michelle Barrow DProf

Dr Barrow is the Academic Team Director and Clinical Director at CNELM. Michelle completed a Doctorate in Professional Studies (DProf) in 2019, titled "Leading transformation in Personalised Nutrition Practice". Her doctoral research included the construction of clinical tools to enable the development of a new evidence base for personalised nutrition practice in obesity management. She strives to develop the evidence base to support personalised nutrition practice through her academic work, research supervision, post-doctoral research, and publication. She is published in many scientific journals, including Autoimmunity Reviews, Nutrition Reviews and Current Research in Food and Nutrition.

Nicky Ester MSc

Nicky received her Masters in Nutrition from University College Cork in Ireland. She also has a diploma in nutritional medicine and has trained as Natural Chef. She brings with her over 20 years' experience of working within the Health and Wellbeing sector, 10 years of which were spent in her own private clinical practice. Throughout her career she has given lectures to help increase the awareness of nutrition and its importance in relation to optimal health and well-being. She is passionate about empowering individuals to understand the role they play in their health in order to create meaningful and lasting change.

Chloe Steele MSc

Chloe has an MSc in Personalised Nutrition from the University of Middlesex, and specialises in cardiovascular disease, type 2 diabetes, and anxiety. Chloe started her career at BANT as a member of the Nutrition Evidence Database research team and now has over 5 years experience of research and writing. She has worked in several countries, and is currently in Australia, where she worked for Nutrition Australia and is currently the principal nutritionist for Heart Research Australia. She has published two papers in the Nutrition Medicine Journal, on gut microbiota and collagen. Chloe is a member of BANT and the Nutrition Society of Australia and sits on the editorial board for the Nutrition Medicine Institute in the UK.

Clare Grundel MSc

Following a career in international development and finance, Ms Grundel studied for an MSc in Nutritional Therapy. Clare brings to Nutrition Evidence skills in project management developed over 20 years and more recent experience of critical appraisal of nutrition research. She is a practising Registered Nutritional Therapist based in Cambridge and focuses her nutrition practice on inflammatory arthritis and chronic pain. Clare joined the BANT team in 2017 as Science and Education Manager and manages all aspects of the Nutrition Evidence database.

Sarah Cassar MSc

Sarah is a Registered Nutritional Therapist with a Master's degree in Personalised Nutrition. With a strong background in education, she is committed to bridging the gap between nutrition science and practical application, empowering individuals and families to make informed dietary choices. She delivers educational sessions to children, adolescents, parents, and educators while collaborating with other healthcare professionals to promote holistic health strategies. Passionate about evidence-based nutritional practices, Sarah focuses on their impact on cognitive development, behavioural health, and overall well-being. She actively contributes to the field through research analysis, community engagement, and the indexing of scientific journals, striving to make nutrition education more accessible and impactful.

Wilma Kirsten MSc

Wilma has been in clinical practice since 2005. The topic for her MSc dissertation project was "The impact of Coenzyme Q10 deficiency in late-onset Alzheimer's disease in patients who use cholesterol lowering medication". She furthermore obtained two honours science degrees, one in Nutritional Therapy and the other in Molecular Cell Biology and Health Sciences. Wilma specialises in digestive disorders (IBS and IBD), female hormonal well-being (PMS and menopause), and mental health. She has successfully helped hundreds of patients address symptoms of ill health in her clinic. Wilma is also the author of the popular science book, "Ideal Plate Composition - Choose Food to Help You Be Your Best Self".

Daniel Quinones MSc

Daniel Quinones is a BANT and CNHC Registered Nutritional Therapist. He obtained his nutritional therapy diploma from the College of Naturopathic Medicine and MSc in Personalised Nutrition from CNELM, Middlesex University. Daniel contributes to Nutrition Evidence through his clinical experience working with weight loss clients and research into the drivers of obesity.

Georgie Murphy MSc

Georgie is a Registered Nutritional Therapist and BANT member. She studied Nutritional Therapy at the College of Naturopathic Medicine in London. Prior to this she completed her MSc in Nutrition at King's College London and BSc in Biomedical Science from University College Dublin. Georgie brings experience working as the Head of Nutrition at a personalised nutrition start-up. As well this she has experience in supplement development, clinical research, biotech and early-stage clinical trials. Her passion and areas of specialism include gut health and how it affects skin health.

Mays Al-Ali MSc

Mays is a Registered Nutritionist & Naturopath with a master's in clinical nutrition & diploma in naturopathic nutrition, dividing her time between London, Mallorca and Ibiza. Mays loves to help individuals find their inner health with personalised diet and lifestyle plans - incorporating the latest clinical research, lab & genetic testing and of course, beautifully healthy food. Mays specialises in gut health, hormone balancing, weight loss/disordered eating, and liver support, and is also a fermentation expert, regularly hosting informative workshops & talks.

Gail Brady MSc

Gail is a Registered Nutritional Therapy Practitioner RCNHC MBANT. She qualified in 2013 from The Institute for Optimum Nutrition in London and has since furthered her studies and completed a Master's of Science (MSc) degree in Advanced Nutrition (Research and Practice). The topic for her MSc dissertation project was menopause and potential diet and lifestyle interventions that may help to prevent weight gain. In clinical practice, Gail specialises in female health and works 1:1 with clients using a Functional Medicine framework. She also runs an online course providing a tool kit for managing perimenopause and menopause.

nutrition EVIDENCE SCIENCE FORUM 2025

WE ARE BACK IN LONDON FOR THE SECOND NED SCIENCE FORUM. FEATURING MEMBERS OF OUR NED EDITORIAL BOARD AND SPECIAL GUESTS. WE'LL BE DEBATING:

The Battle of the Polyphenols

A keynote address from **Professor Justin Roberts** on the role of polyphenols in human health and nutritional therapy practice and 'polyphenol pitches' from industry scientists, including Ben Brown ND on quercetin and Joe Lillis on oliphenolia. With a panel discussion and debate with presenters, including questions from the audience. Plus polyphenol prizes!

The Art and the Science of Nutritional Therapy and Lifestyle Medicine

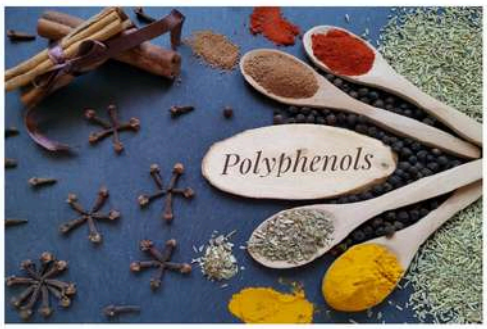
The afternoon continues with a series of presentations on the art and science of nutritional therapy and how BANT nutritional therapy practitioners skillfully embrace both. Includes a headline address from **Tanya Borowski**, a dive into the pathophysiological reasoning with **Dr Michelle Barrow** and exclusive access to interim data from the BANT 2025 IBS impact study from NED Managing Editor, **Clare Grundel**.

Networking and Gala Evening

The NED Science Forum includes plenty of quality networking time with event attendees and sponsors and concludes with a drinks gala evening in the Cavendish Room of The Royal Society of Medicine. **See you there!**

SIGN UP

Each month we publish a dedicated Nutrition Evidence alert with our editorial team's pick of the latest research, podcasts, blog posts and expert reviews. Sign up at https://www.nutrition-evidence.com and have the science delivered straight to your inbox. Follow our socials for weekly posts on topics of interest.



Nutrition Evidence Alert – April 2025 – The Latest Research on Curcumin, Resveratrol, Quercetin and more...

From our Expert Review Panel Curcumin extract improves beta cell functions in obese patients with type 2 diabetes: a randomized controlled trial in Nutrition Journal. 2024. With Expert Review from...

Nutrition Evidence Alert – February 2025 – Hashimoto's Thyroiditis and Graves' Disease

From our Expert Review Panel The Influence of Nutritional Intervention in the Treatment of Hashimoto's Thyroiditis-A Systematic Review in Nutrients. 2023. With Expert Review from Ana-Paula...

POLYPHENOLS AND EXERCISE:

A SPOTLIGHT ON OLIVE DERIVED HYDROXYTYROSOL AND PHYSICAL ACTIVITY

Authors: Doctoral candidate Joseph B Lillis and Professor Justin D Roberts

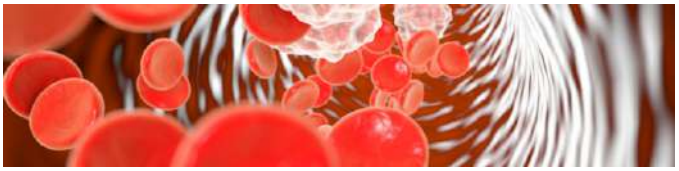
ABOUT POLYPHENOLS

POLYPHENOLS

The term polyphenol is fortunately becoming increasingly well understood in both a sporting and general context. Their role in the governance of human health renders them an indispensable component of our diet that must not be overlooked. Acting as an antioxidant [1], regulating metabolism, body weight, chronic disease and cell proliferation [2] their anti-inflammatory and immunomodulatory effects may be pertinent to exercise, training, performance and recovery.

BRIEF OVERVIEW OF THE MECHANISMS INVOLVED

Free radicals and reactive oxygen species are the primary oxidising agents produced in different cellular biomechanical reactions (e.g., mitochondria for aerobic oxygen production) [3]. The increased oxygen supply required by skeletal muscle amid exercise results in a heightened production of free radicals. Consequently, with the increased production of reactive oxygen species, an imbalance between oxidants and antioxidants [4] induces oxidative damage, or in an exercise setting, exercise induced muscle damage, leading to delayed onset muscle soreness (DOMs). Importantly however, due to the rapid absorption of most polyphenols at a gut level and limited vigorous bioavailability research, it is currently unclear if an appropriate amount of a phenolic compound (or its secondary metabolites) reaches the tissue to therefore impact oxidative damage.



THE ANTI-INFLAMMATORY IMPACT OF POLYPHENOLS SURROUNDING EXERCISE

An inflammatory response occurs in severe perturbations of homeostasis [5]. As a protective response, inflammation is comprised of four phases: inducting (tissue damage or infection), sensing (macrophages), mediating (cytokines) and effecting (tissues) [6]. Dependent upon athlete ability, exercise type, intensity and duration, exercise bouts can initiate a cascade of inflammatory events [7]. Interactions, primarily between immune cells and cytokines, create an inflammatory milieu that is responsible for adaptation to exercise and subsequent recovery [8]. However, the excessive production of reactive oxygen species present from exercise may cause tissue injury, and/or a heightened inflammatory response [9].

The mechanisms responsible for polyphenols' antioxidant capacity have been attributed to the suppression of reactive oxygen species formation, scavenging of reactive oxygen species and the upregulation of antioxidant defences [10] ultimately exerting anti-inflammatory responses that accelerates recovery time and reducing muscle soreness. An excellent review by Rickards et al., 2021 identified that the addition of polyphenol rich food-based products (such as cocoa, tart cherry and beetroot juice) in days surrounding exercise and exercise induced muscle damage, accelerates the recovery of muscle function by up to 13% and reduces muscle soreness up to 29% [11]. Mechanisms surrounding pain reduction, DOMs and fatigue remain controversial due to their complex, multifactorial nature and specificity to exercise type [12]. However, two current theories being explored focus on reduced vasodilatory capacity [13] and impaired calcium handling and sensitivity [11], both consequences of the excessive generation of reactive oxygen species present in exercise.

HYDROXYTYROSOL, A NOVEL POLYPHENOL

Following the recent exposure of the blue zone study in mainstream media, a spotlight has been shone on certain dietary principles that may be pertinent to exercise performance and recovery, in particular, the Mediterranean diet. The discernible health benefits associated with the traditional Mediterranean diet, notorious for high phenolic intake [14], have been partly attributed to the consumption of olives and olive oil [15] and by extension one of the main polyphenols found in olives, hydroxytyrosol (HT). HT originates during the ripening and storage of olives and is abundant in the olive fruit (65.9mg·100g-1 and 55.6mg·100g-1 raw black and green respectively), extra virgin olive oil in the form of oleuropein (>0.77mg·100ml-1) and in lower quantities, can be found in olive leaves and wine [16, 17].

Current scientific interest in this compound is compelling due its antioxidant activity [18, 19], efficient protection of vascular tissue [20] and ability to neutralise free radicals via hydrogen-donation [21]. Despite this, there is a paucity of scientific evidence pertaining to the impact of HT in an exercise setting. Initial investigation via a commercially available olive mill wastewater (OliPhenolia®) rich in HT, demonstrated evidence of therapeutic effects of an acute supplementation period on parameters of exercise performance.

OLIPHENOLIA: FORM, FUNCTION AND EVIDENCE

Fattoria La Vialla is an organic and biodynamic farm in Tuscany, Italy. In 2010, La Vialla established OliPhenolia® with the primary goal of enhancing the valuable substances present in the previously discarded polyphenol rich olive fruit water.

Each 25mL dose of OliPhenolia® contains >30mg of HT and 225mg of other bioavailable polyphenols (including HT metabolites) offering a potent, but more importantly natural, boost of HT. Novel research exploring HT has evidenced a positive upregulation of antioxidant defences [18] as well as effective modification of oxidative stress markers [22] that may prove pertinent to aerobic exercise performance. Recent research from our group explored the effect of OliPhenolia® on aerobic exercise, acute recovery and exercise induced oxidative stress. Interestingly, a 16-day supplementation (~56mL daily) improved running economy at low intensities and led to modest improvements in acute recovery [23]. Additionally, OliPhenolia® demonstrated modest antioxidant effects based on a reduction in superoxide dismutase activity post-exercise and at 24 h, and an increase in reduced glutathione immediately post-exercise compared with a placebo control [24]. As the first study of its kind, it has been suggested that that further investigation into alternate recovery periods (i.e., inflammatory and muscle soreness measures 1, 12, 24, and 48 h+ following damaging exercise) be undertaken to confirm initial findings and expand upon this important field of research.

PHYSICAL ACTIVITY

TRANSLATIONAL APPLICATIONS FOR PHYSICAL ACTIVITY

- Polyphenols (including HT) are recognised as molecules with the ability to modulate pathways that regulate essential biological functions (e.g. ATP production and thermogenesis) [25], leading to an enhancement of mitochondrial function and cellular defences [26].
- A lower respiratory exchange ratio (RER) and increase in lactate threshold has been demonstrated throughout exercise studies following HT supplementation [27, 28], correlating with a 4.7% increase in cycling time trial performance [28].
- With the current knowledge surrounding bioavailability and metabolism of HT [29], an increase in olive derived HT via dietary sources, or a strategic supplementation method (~ 120mg·d-1 for up to 6 weeks [30], or 200mg 30 minutes pre-exercise in addition to a daily dose [27]), may offer a targeted approach to limiting the negative impacts associated with excessive exercise induced oxidative stress, whilst supporting adaptive mechanisms to training that can elicit improvements in both exercise performance and recovery.

CLINICAL APPLICATION

APPLICATIONS FOR NUTRITION PRACTITIONERS

- The emerging evidence pertaining to the potential therapeutic effects of HT in an exercise setting is promising and has been discussed, however from a nutritional therapist perspective practitioners should consider the following:
- A strategic increase in HT via dietary sources, or a natural phytocomplex (OliPhenolia®), could offer an effective and accessible short-term strategy for people looking to engage in a lifestyle change and combat prevalent health issues such as osteoarthritis or obesity.
- **OliPhenolia®** offers a natural and pragmatic approach to increasing daily dietary polyphenol intake.
- Further research is required to continue developing knowledge surrounding the therapeutic effects associated with OliPhenolia®. Currently our group are investigating the impact acute and chronic supplementation may have on inflammatory biomarkers and functional movement. Due to the inherent link between oxidative stress and inflammation, it is anticipated the findings will provide an insight into additional areas pertinent to human health, i.e., metabolic disease such as Diabetes mellitus.
- It is important that habitual polyphenol intake and current diet status are considered by a practitioner ahead of implementing any changes to the diet.

See pages 66-67 for references

CURCUMIN

4 REVIEWS

CURCUMIN FOR OBESITY

CURCUMIN EXTRACT IMPROVES BETA CELL FUNCTIONS IN OBESE PATIENTS WITH TYPE 2 DIABETES: A RANDOMIZED CONTROLLED TRIAL

Yaikwawong, M ; Jansarikit, L ; Jirawatnotai, S ; Chuengsamarn, S
Nutrition journal. 2024;23(1):119

TAKE HOME MESSAGE:

- **Curcumin appears to be safe and effective for the management of patients with T2DM and obesity when given with metformin.**

INTRODUCTION:

- The aim of this study was to evaluate the potential benefits of curcumin in patients with obesity and type 2 diabetes mellitus (T2DM) on β-cell function as well as metabolic and obesity markers.

METHOD:

- Double-blind, randomised, placebo-controlled trial conducted in Thailand.
- 229 adults aged 35 years or over with diagnosis of T2DM within the past year and body mass index (BMI) over 23.
- All subjects received metformin and education on healthy nutrition and lifestyle.
- Patients were randomised to 3 x 2 curcumin capsules per day with a total daily curcuminoid content of 1500mg or matching placebo.
- Duration: 12 months.
- Primary outcome: β-cell function (homeostasis model assessment, HOMA-β).
- Secondary outcomes: fasting plasma glucose (FPG), glycated haemoglobin (HbA1C), body weight, BMI, insulin, insulin resistance (IR, by HOMA-IR), adiponectin and leptin.

? CONSIDERATIONS FOR FUTURE RESEARCH:

- Clinical trials on curcumin as a first-line treatment, in conjunction with diet and lifestyle advice, in newly diagnosed T2DM patients and/or pre-diabetics would be of value.
- Clinical trials evaluating the safety and efficacy of curcumin alongside other anti-diabetic and anti-obesity drugs, such as GLP1 agonists.

CONCLUSIONS:

- **The authors concluded that curcumin appears to improve β-cell function, IR and body weight in patients with T2DM and obesity with only minor adverse effects.**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

RESULTS:

- **At 12 months, significantly better outcomes were seen in the curcumin compared to the placebo group for all metabolic and β-cell-related measures: HOMA-β (values at 12 months: 136.20 vs 105.19, p<0.01), FPG (115.49 mg/ml vs 130.71 mg/dl, p<0.05), HbA1C (6.12% vs 6.47%, p<0.05), insulin (16.05 uU/ml vs 18.54 uU/ml, p<0.01), HOMA-IR (4.86 vs 6.04, p<0.001), adiponectin (14.51 ug/ml vs 10.36 ug/ml, p<0.001) and leptin (9.42 ug/ml vs 20.66 ug/ml, p<0.001).**
- **At 12 months, BMI and body weight had reduced significantly more in the curcumin compared to the placebo group (values at 12 months: from 27.35 to 25.98 vs 26.94 to 27.34 and 69.92 to 66.1 kg vs 69.50 to 69.3 kg, respectively, both p<0.001, baseline values not significantly different).**
- **In the curcumin group, there was a significant correlation between body weight and HbA1c (p=0.01). There were no significant correlations between any other parameters in either group.**
- **In the curcumin group, 12.3% of patients experienced abdominal pain and 7.9% diarrhoea, compared to none in the placebo group. Headaches were experienced by 1.7% in the placebo and 4.4% in the curcumin group. It was not reported whether these differences were statistically significant. There were no significant differences in kidney or liver function tests between groups.**

CLINICAL PRACTICE APPLICATIONS:

- Curcumin can be a valid supplement alongside metformin to improve metabolic parameters and weight in patients diagnosed with T2DM within the past year and obesity.
- Curcumin appears to be safe to be used alongside metformin.

EXPERT REVIEWER Karin Elgar

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

CURCUMIN & MUSCLE DAMAGE

META-ANALYSIS OF THE EFFECT OF CURCUMIN SUPPLEMENTATION ON SKELETAL MUSCLE DAMAGE STATUS

Liu, X ; Lin, L ; Hu, G
PloS one. 2024;19(7):e0299135

INTRODUCTION:

A meta-analysis was conducted to examine the effect of curcumin supplementation on key markers of skeletal muscle damage, aiming to propose an optimal intervention program.

METHOD:

- A systematic search of multiple databases including Web of Science, ScienceDirect, China National Knowledge Infrastructure (CNKI), PubMed, and Wanfang was conducted.
- The computerised search focused on randomised controlled trials (RCTs), with adult subjects, using curcumin or a curcumin-based supplement as the focus.
- Primary outcome assessments included creatine kinase (CK), muscle soreness, interLeukin-6 (IL6), and range of motion (ROM).

RESULTS:

- **14 studies encompassing 334 participants met the inclusion criteria.**
- **A pooled analysis of 12 studies demonstrated that curcumin supplementation significantly alleviated sore muscles (MD=-0.61,CI:-0.81,-0.41: p<0.00001).**
- **Curcumin intake was associated with a reduction in CK levels, indicating decreased muscle damage (MD=-137.32,CI: -238.82,-35.82, p<0.008).**
- **Data from three studies found that curcumin supplementation significantly enhanced ROM (MD=4.10,CI:1.45,6.75, p=0.0002).**
- **Analysis of five studies found that curcumin supplementation lowered IL-6, suggesting anti-inflammatory effects (MD=-0.33, CI: -0.56,-0.09,p<0.007).**
- **Subgroup analysis based on supplement timing revealed that the most pronounced reduction in muscle soreness occurred at the 96-hour post exercise (MD=1.24, p<0.0001).**
- **Intervention duration analysis showed that supplementation for more than one week yielded the greatest effect (MD=-0.83, p<0.00001).**
- **Dose-dependent analysis indicated the most significant reduction in CK levels occurred in the group that received <0.5g of curcumin (MD=-243.27, p=0.002).**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **Curcumin supplementation has been shown to improve creatinine kinase (CK) levels, muscle soreness, IL-6 and range of motion (ROM).**
- **These findings suggest that both dosage and timing play an important role in determining its efficacy.**
- **To help improve muscle soreness and ROM, a low-dose daily supplement (< 0.5g) one week in advance of physical endurance activity may be most effective.**
- **To help reduce CK and IL-6 levels, a low-dose supplement taken immediately post-exercise may provide the best results.**

CLINICAL PRACTICE APPLICATIONS:

- Curcumin is known for its anti-inflammatory properties, acting by downregulating cytokines, prostaglandins and histamine.
- Curcumin may serve as an adjunctive supplement for managing exercise-induced muscle damage (EIMD), helping to lower CK levels and reduce inflammatory markers (IL-6) post-exercise.
- For Muscle Soreness and ROM: Low-dose supplementation (<0.5g/day) for at least a week before exercise is reported to be most effective.
- For Reducing CK and IL-6 Levels: supplementation of 0.5–1.5g/day immediately post-exercise may yield the best results.

CONSIDERATIONS FOR FUTURE RESEARCH:

- Further research is needed to understand the impact of inflammatory markers on post-training inflammation and curcumin supplementation.
- Future studies should aim to investigate bioavailability-enhanced formulations (e.g., curcumin with piperine) to establish maximum effectiveness in modulating interleukins and other inflammatory markers.
- Dose-response studies are needed to refine the optimal curcumin dosage.
- Further clinical trials in patients with chronic pain and inflammatory muscle disorders could provide additional evidence supporting curcumin supplement's therapeutic applications.

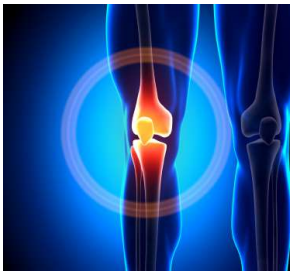
CONCLUSIONS:

This meta-analysis suggests that curcumin supplementation may effectively reduce muscle soreness, lower CK and IL-6 levels, and enhance range of movement.

EXPERT REVIEWER Ana-Paula Agrela

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

CURCUMIN FOR OSTEOARTHRITIS



EFFICACY AND SAFETY OF CURCUMIN THERAPY FOR KNEE OSTEOARTHRITIS: A BAYESIAN NETWORK META-ANALYSIS.

Zhao, J ; Liang, G ; Zhou, G ; Hong, K ; Yang, W ; Liu, J ; Zeng, L
Journal of ethnopharmacology. 2024;321:117493

INTRODUCTION:

- The aim of this systematic review with meta-analysis was to evaluate the efficacy and safety of curcumin, both alone and in combination with other drugs, in Knee Osteoarthritis (KOA) treatment through a Bayesian network meta-analysis.

METHOD:

- Randomised controlled trials of oral curcumin for KOA treatment were sought from PubMed, Embase and Cochrane from establishment of the database to April 2023.
- Participants in the control groups could take placebo, Chondroprotective drugs (CP), and non-steroid anti-inflammatory drugs (NSAIDs) orally.
- Included studies needed to report one of the following outcomes: visual analogue scale (VAS) pain score, a specific Osteoarthritis Index (WOMAC) score, use of rescue medication (RM), or adverse events (AE).
- This study followed PRISMA guidelines and is registered with PROSPERO.
- The Bayesian network meta-analysis utilised a random effects model.

RESULTS: **23 studies met the inclusion criteria, which included a total of 2175 KOA patients and 6 interventions:**

- **1) curcumin, 2) CP, 3) curcumin + CP, 4) curcumin + NSAIDs, 5) NSAIDs and 6) placebo. The methodological quality of the included papers was considered acceptable, with the majority deemed low risk.**
- **Curcumin significantly reduced the visual analogue scale (VAS) pain score compared to placebo (MD = -1.63, 95% CI: -2.91 to -0.45).**
- **Curcumin also significantly reduced the total WOMAC pain score compared to placebo (MD = -18.85, 95% CI: -29.53 to -8.76).**
- **Curcumin reduced the need for rescue medication (OR = 0.17, 95% CI: 0.08 to 0.36).**
- **Curcumin + NSAIDs significantly lowered the need for rescue medication (OR = 0.01, 95% CI: 0.00 to 0.13).**
- **NSAIDs alone also reduced rescue medication use (OR = 0.11, 95% CI: 0.02 to 0.47).**
- **Curcumin had a lower incidence of AE's (OR = 0.51, 95% CI: 0.25 to 0.94).**
- **Curcumin + NSAIDs also showed a reduced incidence of AE's (OR = 0.23, 95% CI: 0.06 to 0.9).**
- **Curcumin monotherapy, curcumin + chondroprotective agents (CP), and curcumin + NSAIDs have strong clinical value in treating KOA.**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **Curcumin significantly reduces pain (VAS score) and joint symptoms (WOMAC score) compared to placebo.**
- **It is effective alone or in combination with NSAIDs or CP, with curcumin + CP ranking best for pain relief.**
- **Curcumin demonstrates clinical value, but further clinical studies are needed to confirm its long-term benefits and optimal drug combinations.**

CLINICAL PRACTICE APPLICATIONS:

- Curcumin supplementation should be considered in KOA cases, including in combination with other treatments.
- There were differences in the curcumin products used in the included studies, but doses ranged from 100 to 2000mg/day.
- Duration of interventions of included studies ranged from 4 weeks to 4 months.

CONSIDERATIONS FOR FUTURE RESEARCH:

- Further clinical research should be undertaken to verify the findings of these results.
- Research should compare efficacy of different forms of curcumin supplementation.
- Pharmacological mechanisms of curcumin in treating KOA should be studied.

CONCLUSIONS:

- **The combination of curcumin with NSAIDs or CP may increase the anti-inflammatory and analgesic pharmacological effects and reduce adverse reactions.**

EXPERT REVIEWER Michelle Barrow DProf

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

CURCUMIN & HIGH DOSE EPA IN T2DM

THE EFFECT OF CURCUMIN AND HIGH-CONTENT EICOSAPENTAENOIC ACID SUPPLEMENTATIONS IN TYPE 2 DIABETES MELLITUS PATIENTS: A DOUBLE-BLINDED RANDOMIZED CLINICAL TRIAL

Asghari, KM ; Saleh, P ; Salekzamani, Y ; Dolatkhah, N ; Aghamohammadzadeh, N ; Hashemian, M
Nutrition & diabetes. 2024;14(1):14

INTRODUCTION:

- Type 2 Diabetes mellitus (DM2), characterised by insulin resistance and impaired glucose regulation, is the most prevalent metabolic disorder globally. The study investigated the complementary and synergistic effects of curcumin and high EPA supplementation on DM2.

METHOD:

- The study was a double-blind and randomised controlled trial conducted in Tabriz, Iran.
- Participants: > 18 years, diagnosed with DM2 per American Diabetes Association criteria. Diabetes status was moderately controlled, (HbA1C>5.8%) and medication maintained for more than four months.
- 100 patients qualified for inclusion, with a mean age of 56.40 and a BMI of 28.1. 95 completed the study.
- For a 12-week period participants were assigned (by random stratification) into four groups based on their sex and BMI:
  - Group 1 – 2 x 500mg EPA + 200mg DHA capsules daily + 1 x nano curcumin placebo capsule.
  - Group 2 – 2 x placebo omega-3 capsules + 1 x 80 mg nano curcumin capsule.
  - Group 3 – 2 x 500mg EPA + 200mg DHA capsules + 1 x 80mg nano curcumin capsule.
  - Group 4 – 2 x placebo omega-3 capsules + 1 x nano curcumin placebo capsule.
- Assessed markers included glycaemic, oxidative, inflammatory, cardiometabolic and vascular endothelial growth factor (VEGF) gene expression.
- The HOMA-IR and QUICKI indices were used to understand insulin resistance and sensitivity respectively.

RESULTS:

- **Both high sensitivity C-reactive protein and malondialdehyde significantly decreased with EPA ($p<0.01$; $p<0.05$), nano curcumin ($p<0.05$; $p<0.05$) and EPA+nano curcumin ($p<0.01$; $p<0.01$).**
- **Total antioxidant capacity increased significantly with EPA+nano curcumin ($p<0.01$).**
- **Serum insulin significantly decreased with EPA+nano curcumin (MD:-11.44 (-2.70, -0.17)) versus placebo (MD-0.63 (-1.97, 0.69)).**
- **HOMA-IR and QUICKI indices were not significantly different between groups.**
- **Total cholesterol, triglycerides, low-density lipoprotein and very low-density lipoprotein levels significantly decreased in the combination group. High density lipoproteins increased (MD:12.07 (4.05,20.09)).**
- **Within-group the combination group led to significant increases in serum VEGF ($p<0.05$).**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **Consider supplementing with high dose EPA omega-3 fatty acids and nano-curcumin when working with clients with DM2 to support improved glycaemic control, reduced inflammation and enhanced lipid profiles for improved metabolic health.**
- **Supplementing with curcumin could help to improve fasting insulin and insulin resistance.**
- **Supplementing with high dose EPA omega-3 fatty acids could help to reduce triglyceride levels.**

CLINICAL PRACTICE APPLICATIONS:

- The study highlights the potential benefits of an integrated approach in managing DM2 using complementary strategies alongside conventional treatment.

? CONSIDERATIONS FOR FUTURE RESEARCH:

- The sample size of this study was small (90), a larger study would help validate the findings.
- Following participants over a longer period would help to confirm the long-term benefit of supplementation to reduce DM2 complications.
- Longer studies would help determine if supplementing with high dose EPA omega 3 fatty acids and curcumin reduces the amount of prescribed medication needed to control DM2.
- Future research could focus on newly diagnosed patients to assess the impact high dose EPA and curcumin supplementation has on disease outcomes.
- Targeted investigations to understand the specific interaction of supplements like curcumin on medication used in diabetes.

CONCLUSIONS:

- **Combined supplementation of high-dose EPA omega-3 fatty acids and curcumin significantly improved glycaemic control, lipid profiles and inflammatory markers in DM2 patients compared to supplementing either supplement alone.**

EXPERT REVIEWER Nicky Ester

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

CURCUMIN HEALTH & SCIENCE TAKEAWAYS

NED INFOBITES & CLINICAL RESOURCES

Not yet discovered our one page science summaries? Our NED InfoBites are designed to provide quick overviews of some of the latest research available on particular health issues and nutrition topics. Designed as a one-page clinical handout, the NED InfoBites unite our editorial team's pick of the research and provide a plain-language summary suitable for sharing with nutrition clients. Download the latest InfoBites on Curcumin here.

Additionally, BANT has developed a dedicated range of resources to support practitioners and educate on common symptoms, biological processes, and dietary and lifestyle approaches to health and well-being. These are suitable to share with clients in clinical consultations and group programmes.

CLIENT-FRIENDLY GUIDES:

Providing practitioners with health resources and client-friendly educational materials to support their clinical recommendations.

TURMERIC FORMULATION

4 REVIEWS

THIS SECTION IS IN PARTNERSHIP WITH

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Metagenics

FORMULA FOR MENSTRUAL PAIN

EFFECT OF TURMERIC-BOSWELLIA-SESAME FORMULATION IN MENSTRUAL CRAMP PAIN ASSOCIATED WITH PRIMARY DYSMENORRHEA-A DOUBLE-BLIND, RANDOMIZED, PLACEBO-CONTROLLED STUDY

Agarwal, D ; Chaudhary, P
Journal of clinical medicine. 2023;12(12)

TAKE HOME MESSAGE:

- **A combination of turmeric, Boswellia and sesame oil may provide symptomatic relief from menstrual pain associated with primary dysmenorrhoea.**

INTRODUCTION:

- The aim of this randomised controlled trial (RCT) was to evaluate the efficacy of a proprietary formulation containing turmeric, Boswellia and sesame oil for primary dysmenorrhea.

METHOD:

- Double-blind, randomised, placebo-controlled trial.
- 60 women aged 18 to 35 years with primary dysmenorrhea with menstrual cramp pains rated as moderate (at least 2 on a scale of 0-3, 3 being severe) divided into 2 groups.
- The intervention group received 1000 mg single dose of 28% turmeric extract (95%), 10% Boswellia serrata extract and 62% sesame oil.
- The intervention or placebo were taken when menstrual pain reached at least 5 on the Numerical Rating Scale (NRS).
- Baseline pain was assessed with the NRS (0–10, 10 being worst pain), and pain relief was monitored every 30 mins using the NRS and Categorical Pain Relief Scale (PRS, 0–4, 4 being complete relief). At 6 hours a Global Evaluation Assessment (GEA, 0-4, 4 being excellent) was completed. If rescue medication was required before 6h, GEA was assessed just before administration of medication.
- Outcome measures were total pain relief scores (TOTPAR, the sum of PRS over 6h) and summed pain intensity difference (SPID, sum of the differences between the current pain scores and baseline pain score over the 6 h using the NRS).

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

RESULTS:

- **No adverse events were reported and all participants completed the study.**
- **The mean total pain relief (TOTPAR) of the intervention was 12.6 times better than the placebo: 1.5 (0.39) (mean (SD)) for the placebo 18.9 (0.56) for the intervention group ($p<0.001$).**
- **The sum of pain (SPID) at 6 hours was 20.19 better for the intervention than placebo: 1.7 (3.1) for the placebo and 34.3 (7.7) for the intervention group ($p<0.0001$).**
- **GEA: In the placebo group no participant gave a rating of "good", "very good" or "excellent" whilst 25 rated efficacy as "poor" and 5 as "fair". In the treatment group, 22 rated efficacy as "excellent" and 8 as "very good", $p<0.0001$.**

CLINICAL PRACTICE APPLICATIONS:

- A combination of turmeric, Boswellia and sesame oil could be considered for patients with primary dysmenorrhoea for symptomatic pain relief.

CONSIDERATIONS FOR FUTURE RESEARCH:

- This was a pilot study and larger studies of a longer duration should be carried out to confirm the results of this study.

CONCLUSIONS:

- **The authors concluded the turmeric-Boswellia-sesame oil formulation was a safe alternative for menstrual pain relief.**

EXPERT REVIEWER Karin Elgar

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

MUSCULOSKELETAL PAIN & TURMERIC

FAST PAIN RELIEF IN EXERCISE-INDUCED ACUTE MUSCULOSKELETAL PAIN BY TURMERIC-BOSWELLIA FORMULATION: A RANDOMIZED PLACEBO-CONTROLLED DOUBLE-BLINDED MULTICENTRE STUDY.

Rudrappa, GH ; Murthy, M ; Saklecha, S ; Kumar Kare, S ; Gupta, A ; Basu, I
Medicine. 2022;101(35):e30144

TAKE HOME MESSAGE:

- **Exercise induced MSK can result in significant injuries and limit training and performance of athletes.**
- **Commonly prescribed over-the-counter analgesics may affect some of the positive post-exercise benefits and have known side effects.**
- **The supplementation of TBF may be a fast acting alternative treatment for exercise induced MSK pain.**

INTRODUCTION:

- Exercise-induced musculoskeletal (MSK) pain is a common occurrence but can be limiting and lead to injuries or inflammation.
- Analgesics are commonly used over-the-counter medications; however, it is unclear as to their benefit for exercise-induced pain management as they may be detrimental to recovery.
- Alternative treatments may have merit and turmeric and boswellia have been shown to have anti-inflammatory properties. These compounds have been growing in popularity for their use as an adjunct to MSK pain medications.
- This study aimed to evaluate the efficacy of a turmeric-boswellia formulation (TBF) on acute MSK pain.

METHOD:

- This was a randomised placebo-controlled double-blind multi-centre trial of 232 individuals with exercise induced MSK pain.
- Participants were split into two groups TBF (Rhuleave-K 1000mg/d) or placebo (1000mg/d).
- The trial ran for 7 days.
- Exercise induced pain included lower back, shoulder, knees, lower body and other types of pain.

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

RESULTS:

- **Pain intensity was reduced with TBF when at rest, when moving and when pressure was applied compared to placebo (P=<0.001).**
- **TBF was more effective at obtaining pain relief than placebo according to the Total Pain Relief scale (P= <0.0001).**
- **Pain relief was fast following TBF, with meaningful pain relief achieved within 191.6 minutes compared to 358.1 minutes in the placebo group.**
- **39% of participants given TBF reported noticeable pain relief as early as 30 minutes, whereas only 1.7% reported noticeable pain relief after 30 minutes in the placebo group.**
- **Symptom resolution was much more likely in those given TBF than placebo (P=<0.001).**

CLINICAL PRACTICE APPLICATIONS:

- TBF in the form of Rhuleave-K (1000mg/day) may provide a natural, fast and effective alternative to analgesics in treating exercise induced MSK.

? CONSIDERATIONS FOR FUTURE RESEARCH:

- Research on the use of TBF for the management of other sources of pain should be considered.

CONCLUSIONS:

- **TBF is effective at relieving exercise induced MSK within 3 hours.**

EXPERT REVIEWER Chloe Steele

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

EFFICACY OF TSF FOR PAIN RELIEF

EFFICACY OF HIGH-DISSOLUTION TURMERIC-SESAME FORMULATION FOR PAIN RELIEF IN ADULT SUBJECTS WITH ACUTE MUSCULOSKELETAL PAIN COMPARED TO ACETAMINOPHEN: A RANDOMIZED CONTROLLED STUDY.

Rudrappa, GH ; Chakravarthi, PT ; Benny, IR
Medicine. 2020;99(28):e20373

TAKE HOME MESSAGE:

- **Pharmacological treatments may not be the only option for MSK pain relief.**
- **If a natural alternative is preferred or pharmacological treatments are contraindicated then a combination of curcumin, B. serrata, and sesame oil in the form of Rhuleave-K (1000mg/day) may help to relieve pain.**

INTRODUCTION:

- Acute musculoskeletal (MSK) pain occurs within the muscles, ligaments, joints, and tendons and is mostly managed with non-steroidal anti-inflammatory drugs such as acetaminophen.
- There may be some benefits to MSK pain when using non-pharmacological treatments.
- Curcumin, Boswellia serrata, and sesame oil have been shown to have anti-inflammatory and analgesic effects yet it is unclear as to their efficacy when combined on MSK pain.
- This randomised control trial aimed to determine the effects of a combination of these compared to acetaminophen.

METHOD:

- This was a randomised active controlled open label study.
- The study included 88 male and female individuals aged 18-65 years.
- Participants were randomised to either 1000 mg/d curcumin, B. serrata, and sesame oil (Rhuleave-K) or 1000 mg/d acetaminophen.
- The study ran for 7 days.

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

RESULTS:

- **Both treatments were equally efficacious on the reduction of pain (meaningful pain relief P =0.228, and perceptible pain relief; P =0.793).**
- **Pain relief was seen in both groups from baseline with no differences between the two groups through the assessment of the total pain relief scale (TOTPAR P=0.529 after 7 days), the pain relief score (PRS; P=0.748 after 7 days), and the McGill Pain Relief Questionnaire (P=0.468).**
- **Both groups provided sensory pain relief but the curcumin group was 8.57 times better than acetaminophen at reducing the unpleasantness and emotional aspects involved with acute pain (P=0.027).**

CLINICAL PRACTICE APPLICATIONS:

- The clinical effects on MSK pain of curcumin, B. serrata, and sesame oil combination may be equivalent to acetaminophen.
- For relief of the unpleasantness associated with pain, this natural alternative may be more effective than acetaminophen.
- Practitioners may like to consider recommending a combination of curcumin, B. serrata, and sesame oil for the relief of MSK pain symptoms in those who would like a natural alternative or who are contraindicated to acetaminophen.

CONSIDERATIONS FOR FUTURE RESEARCH:

- Future research may like to consider looking at other causes and sites of pain to determine if this natural combination may be of benefit.

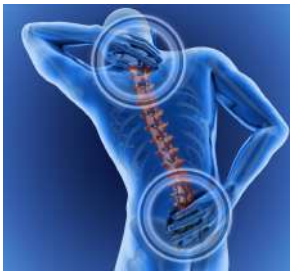
CONCLUSIONS:

- It was concluded that Rhuleave-K is a natural, safe, and effective alternative to acetaminophen for MSK pain.

EXPERT REVIEWER Chloe Steele

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

RHULEAVE-K IN LOWER BACK PAIN



THE EFFECT OF TURMERIC-BOSWELLIA FORMULATION (RHULEAVE-K) IN POSTURE-RELATED LOW BACK SORENESS AND DISCOMFORT: A RANDOMIZED DOUBLE BLINDED PLACEBO CONTROLLED TRIAL

Gupta, A ; Agarwal, A
Journal of back and musculoskeletal rehabilitation. 2025;:10538127241296343

INTRODUCTION:

This randomised double-blind placebo controlled trial evaluated the efficacy of a proprietary formulation Rhuleave-K (combining curcumin and Boswellia extracts in sesame oil), on lower-back posture related pain and discomfort over 15 days.

METHOD:

- Following power calculation, 52 adults aged 18-70, with an equal ratio male:female, with lower back discomfort from multiple causes were enrolled.
- 26 participants, stratified by gender, were allocated to the intervention arm of 500mg of Rhuleave-K daily for 15 days. The matched control did not contain any active ingredients and was a mix of polysorbate-80 and PEG 400.
- Primary outcome measure was the mean change in the sum of pain intensity difference at days 1, 7 and 15. Pain intensity was assessed using a 0-10 visual analogue rating scale at one hour intervals from baseline to hour 6.
- Secondary outcomes measures were a) mean change in total pain relief at days 1, 7 and 15. and b) mean change in the validated Oswestry Disability Index (ODI).

RESULTS:

- **Perceived pain intensity significantly decreased in the treatment group in comparison to placebo on day one from hours 0-6 (-11.27, p<0.001). Further between group calculations at day 7 and 15 were not possible, as the mean pain intensity score was 0 in both groups.**
- **In the treatment group, the mean total pain relief scores significantly increased (Day 1 -9.81, Day 7 -15.19, Day 15 -22.15, p<0.001) compared to the control group.**
- **There were significant reductions in ODI in the treatment group by day 7 (11.65, p<0.001) and near complete resolution by day 15 (0.27, p<0.001), compared to placebo where no significant change in disability was observed (day 7,15.31, p=0.781; and day 15 15.04, p=0.249).**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **This randomised controlled trial shows that 500mg of Rhuleave-K provides pain intensity relief over 6 hours following administration for those with posture related lower back pain.**
- **Treatment over 15 days for subjects in this study achieved lower back pain resolution.**

CLINICAL PRACTICE APPLICATIONS:

- 500mg of Rhuleave-K appears to provide fast and lasting pain intensity relief for those with posture related lower back pain, as well as a reduction in disability and functional impairment over 15 days.
- There were no dropouts or adverse events in this study, suggesting a well-tolerated, easily implemented protocol.

CONSIDERATIONS FOR FUTURE RESEARCH:

- Longer term follow up of study participants to assess for pain recurrence, given near resolution over 15 days in this study.
- This study is based on subjective participant pain perception. Future studies could combine this with markers of inflammation such as c-reactive protein and erythrocyte sedimentation rate to assess mechanistic impact of Rhuleave-K.
- Future research could compare Rhuleave-K as a combination product with single agents of curcumin and Boswellia serrata to assess for single or combined impact.
- Note that this article does not provide a full description of the pain relief scale used or its validity.

CONCLUSIONS:

- **Perception of posture related lower back pain was significantly reduced over 6 hours following administration of 500mg of proprietary blend of curcumin and Boswellia in a base of sesame oil, Rhuleave-K. Subjective pain relief continued to improve over 7 and 15 days of this study, achieving near full recovery of pain using a 10-point scale.**

EXPERT REVIEWER Clare Grundel

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

TURMERIC BOSWELLIA FORMULATION

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THE EFFECT OF TURMERIC-BOSWELLIA FORMULATION (RHULEAVE-K) IN POSTURE-RELATED LOW BACK SORENESS AND DISCOMFORT: A RANDOMIZED DOUBLE BLINDED PLACEBO CONTROLLED TRIAL

Gupta, A ; Agarwal, A
Journal of back and musculoskeletal rehabilitation. 2025;:10538127241296343

With Expert Review from Clare Grundel

Take Home Message: 500mg of Rhuleave-K provides pain intensity relief over 6 hours following administration for those with posture related lower back pain.

This randomised double-blind placebo controlled trial evaluated the efficacy of a proprietary formulation Rhuleave-K (combining curcumin and Boswellia extracts in sesame oil), on lower-back posture related pain and discomfort over 15 days. 52 adults aged 18-70, with an equal ratio male:female, with lower back discomfort from multiple causes were enrolled. 26 participants, stratified by gender, were allocated to the intervention arm of 500mg of Rhuleave-K daily for 15 days.

Results showed that perceived pain intensity significantly decreased in the treatment group in comparison to placebo on day one from hours 0-6. In the treatment group, the mean total pain relief scores significantly increased compared to the control group and there were significant reductions in validated Oswestry Disability Index in the treatment group by day and near complete resolution by day 15, compared to placebo where no significant change in disability was observed. Authors concluded that the perception of posture related lower back pain was significantly reduced over 6 hours following administration of 500mg of proprietary blend of curcumin and Boswellia in a base of sesame oil, Rhuleave-K. Subjective pain relief continued to improve over 7 and 15 days of this study, achieving near full recovery of pain using a 10-point scale.

FAST PAIN RELIEF IN EXERCISE-INDUCED ACUTE MUSCULOSKELETAL PAIN BY TURMERIC-BOSWELLIA FORMULATION: A RANDOMIZED PLACEBO-CONTROLLED DOUBLE-BLINDED MULTICENTRE STUDY

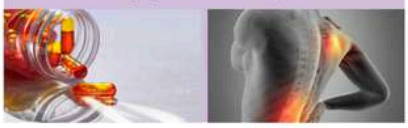
Rudrappa, GH ; Murthy, M ; Saklecha, S ; et al.
Medicine. 2022;101(35):e30144

With Expert Review from Chloe Steele

Take Home Message: The supplementation of TBF may be a fast acting alternative treatment for exercise induced MSK pain.

Muscle pain is common in everyday life, particularly during strenuous or unfamiliar physical activities. While exercise has numerous benefits, it can also lead to acute pain due to injuries or inflammation affecting muscles, joints, ligaments, tendons, and other supporting structures. This randomised, placebo-controlled, double-blinded multicentre study investigated the efficacy of a single 1000 mg dose of a turmeric-boswellia formulation (TBF) in reducing exercise-induced acute muscle pain. The study enrolled 232 healthy participants and assessed pain relief at rest, with movement, and under pressure.

Results showed that TBF provided significant pain relief within approximately three hours, demonstrating strong analgesic activity. The onset of pain relief was rapid, with participants in the TBF group reporting a perceptible pain reduction (PPR) at an average of 68.5 minutes and meaningful pain relief (MPR) at 191.6 minutes, both of which were significantly faster than those in the placebo group. Authors concluded that TBF is an effective and safe natural alternative for managing acute musculoskeletal pain.



EFFICACY OF HIGH-DISSOLUTION TURMERIC-SESAME FORMULATION FOR PAIN RELIEF IN ADULT SUBJECTS WITH ACUTE MUSCULOSKELETAL PAIN COMPARED TO ACETAMINOPHEN: A RANDOMIZED CONTROLLED STUDY

Rudrappa, GH ; Chakravarthi, PT ; Benny, IR
Medicine. 2020;99(28):e20373

With Expert Review from Chloe Steele

Take Home Message: A combination of curcumin, B. serrata-sesame oil in the form of Rhuleave-K (1000mg/day) may help to relieve pain.

Acute muscle and joint pain is often managed with non-steroidal anti-inflammatory drugs such as acetaminophen. Curcumin, Boswellia serrata, and sesame oil are all natural products that have been previously shown to have anti-inflammatory and pain reducing effects. This randomised controlled trial aimed to determine the effects of a combination of these, in a product known as Rhuleave-K, compared to acetaminophen on muscle and joint pain. The results showed that both treatments were equally effective at reducing pain. However, individuals given curcumin, B. serrata, and sesame oil, were 8.57 times more likely to experience reduced unpleasantness and emotional aspects involved with acute pain. It was concluded that this Rhuleave-K is a natural, safe, and effective alternative to acetaminophen for the management of joint and muscle pain. This study could be used by healthcare professionals to understand that there is an alternative for those who are unable to tolerate or who would like a more natural alternative for the management of joint and muscle pain.

EFFECT OF TURMERIC-BOSWELLIA-SESAME FORMULATION IN MENSTRUAL CRAMP PAIN ASSOCIATED WITH PRIMARY DYSMENORRHEA-A DOUBLE-BLIND, RANDOMIZED, PLACEBO-CONTROLLED STUDY

Agarwal, D ; Chaudhary, P
Journal of clinical medicine. 2023;12(12)

With Expert Review from Karin Elgar

Take Home Message: A combination of turmeric, Boswellia and sesame oil may provide symptomatic relief from menstrual pain associated with primary dysmenorrhoea

The aim of this double-blind, randomised, placebo-controlled trial (RCT) was to evaluate the efficacy of a proprietary formulation containing turmeric, Boswellia and sesame oil for primary dysmenorrhea. Sixty women aged 18 to 35 years with primary dysmenorrhea with menstrual cramp pains rated as moderate (at least 2 on a scale of 0-3, 3 being severe) divided into 2 groups. The intervention group received 1000 mg single dose of 28% turmeric extract (95%), 10% Boswellia serrata extract and 62% sesame oil. Results showed that the mean total pain relief of the intervention was 12.6 times better than the placebo and the sum of pain (SPID) at 6 hours was 20.19 better for the intervention than placebo.

The authors concluded the turmeric-Boswellia-sesame oil formulation was a safe alternative for menstrual pain relief.

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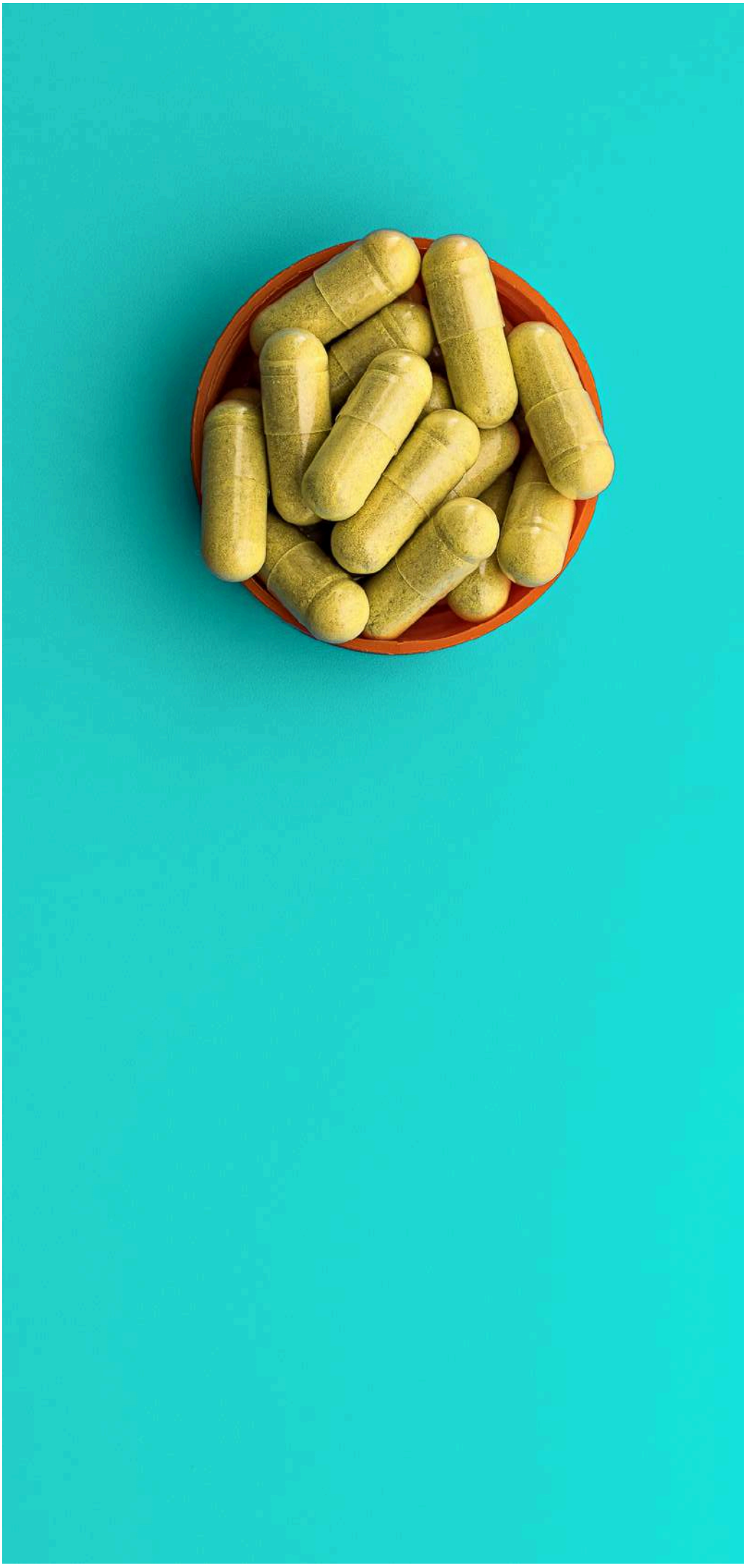
QUERCETIN

2 REVIEWS



TD2M & BENEFITS OF QUERCETIN

BENEFITS OF QUERCETIN ON GLYCATED HEMOGLOBIN, BLOOD PRESSURE, PIKO-6 READINGS, NIGHT-TIME SLEEP, ANXIETY, AND QUALITY OF LIFE IN PATIENTS WITH TYPE 2 DIABETES MELLITUS: A RANDOMIZED CONTROLLED TRIAL

Mantadaki, AE ; Linardakis, M ; Tsakiri, M ; et al.
Journal of clinical medicine. 2024;13(12)

TAKE HOME MESSAGE:

- **Quercetin has demonstrated promising supportive effects in the management of T2MD.**
- **Supplementation at 500 mg per day over 32 weeks is reported to improve HbA1c, reduce systolic blood pressure, and improve lung function, sleep quality, anxiety, and overall quality of life in T2DM patients.**

INTRODUCTION:

A randomised controlled trial was conducted to evaluate the clinical efficacy of quercetin, a naturally occurring flavonoid with antioxidant and anti-inflammatory properties, in individuals with Type 2 Diabetes Mellitus (T2DM).

METHOD:

- 100 Participants (aged 50-79 years) with T2DM taking non-insulin medication were enrolled.
- Participants were randomised to receive either standard care or standard care plus 500mg of quercetin daily.
- The intervention lasted for 12 weeks, followed by an 8-week washout period and a subsequent 12-week supplementation period, a total of 32 weeks.
- Health assessments were conducted at baseline and study endpoint, including blood analysis, lung function via PiKO-6 spirometry, and validated questionnaires: Short Form Health Survey (SF-36) and Short Anxiety Screen Test (SAST-10).
- The primary endpoints included changes in glycated haemoglobin (HbA1c), blood pressure, lipid profile and lung function. Secondary outcomes focused on night-time sleep duration, anxiety levels, and quality of life.
- 88/100 Participants completed the study.

CONCLUSIONS:

- **This study concluded that 500mg of daily quercetin supplementation may improve glycated haemoglobin (HbA1c), systolic blood pressure, lung function (FEV1), night-time sleep duration, anxiety levels and quality of life in patients with T2DM.**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

SELENIUM SUPPLEMENTATION:

- **Glycated Hemoglobin (HbA1C) reduced in the quercetin group compared to the control group (−0.28 0.01; p = 0.011).**
- **There was a reduction in systolic blood pressure in the quercetin group in contrast to the control group (−6.55, −0.24 mmHg; p = 0.029).**
- **There was a statistically significant increase in expiry airflow (FEV1) in the quercetin group compared to the control group (0.12, −0.03 L; p = 0.002).**
- **Similarly, a statistically significant increase in night-time sleep duration in the quercetin group versus the control group (+0.74 vs. −0.47 h; p < 0.001).**
- **Anxiety levels assessed by (SAST-10) decreased in the quercetin group compared to the control group (−5.55, 0.70; p < 0.001).**
- **Both physical (13.99, −10.71; p < 0.001) and mental (14.33, −12.97; p < 0.001) components of the QoL (SF-36 Scale) were found to be significantly improved in the intervention group compared to the control group.**

CLINICAL PRACTICE APPLICATIONS:

- This RCT highlights the potential of quercetin as an adjunctive nutritional therapy for individuals with T2DM.
- When used alongside standard pharmacological treatment 500mg of quercetin daily may help to enhance the outcomes of glycaemic regulation (reducing HbA1c), lowering systolic blood pressure, improving lung function, sleep quality and reducing anxiety.
- Clinicians may consider quercetin supplementation in T2DM clients who are not achieving adequate results through conventional care alone.

? CONSIDERATIONS FOR FUTURE RESEARCH:

- Based on the results of this study further research is warranted to explore the effects of quercetin on insulin sensitivity.
- Future studies are needed on larger sample sizes and diverse populations to explore different dosage-response relationships.
- Additionally, mechanistic studies are needed to reveal quercetin's pathways of action.

EXPERT REVIEWER Ana-Paula Agrela

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

QUERCETIN INTAKE AND TELOMERES

QUERCETIN INTAKE AND ABSOLUTE TELOMERE LENGTH IN PATIENTS WITH TYPE 2 DIABETES MELLITUS: NOVEL FINDINGS FROM A RANDOMIZED CONTROLLED BEFORE-AND-AFTER STUDY

Mantadaki, AE ; Baliou, S ; Linardakis, M ; Vakonaki, E ; Tzatzarakis, MN ; Tsatsakis, A ; Symvoulakis, EK
Pharmaceuticals (Basel, Switzerland). 2024;17(9)

INTRODUCTION:

- This study aimed to assess the relationship between the aging process and type 2 diabetes (T2DM) by investigating the impact of quercetin supplementation on absolute telomere length (aTL) in patients T2DM.

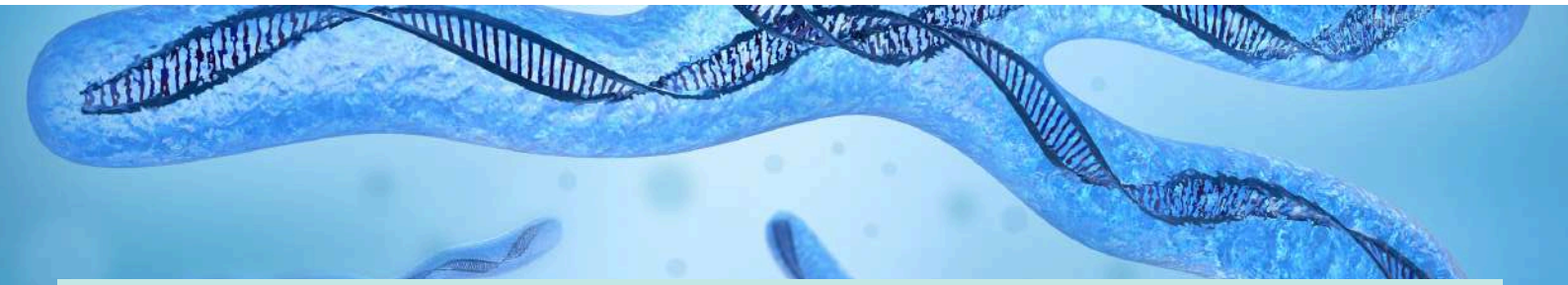
METHOD:

- This was a prospective randomised controlled before-and-after study. It enrolled one hundred patients diagnosed with T2DM who were randomly assigned to the intervention (INT - standard care plus quercetin - 500 mg/day) or control group (CTR - standard care) for two 12-week periods with an 8-week washout period in between. The primary outcome measure was telomere length. Secondary outcomes included night-time sleep duration, health self-assessment, body mass index (BMI), blood pressure, total cholesterol and cholesterol ratio, and glycosylated haemoglobin (HbA1c).

RESULTS:

- **82 participants voluntarily consented to blood sampling for whole blood aTL measurements.**
- **Night-time sleep duration, assessed via self-reported health evaluations, improved in the INT (+0.8 h, $p < 0.001$), while the CTR experienced a decrease (−0.5 h, $p < 0.001$).**
- **Health self-assessment scores in the INT improved whereas those of the CTR decreased (1.5 vs. −0.6, $p < 0.001$).**
- **INT saw a decrease in the systolic blood pressure, while it increased in the CTR (−6.3 vs. 0.5 mmHg, $p = 0.02$).**
- **Blood sugar levels, indicated by HbA1C, decreased more in the INT compared to the CTR (−0.28 vs. 0.03%, $p = 0.008$).**
- **Over the eight-month supplementation period, there was an increase in the average TL per chromosome end in the INT (from 5.11 ± 1.35 to 5.63 ± 2.08 kb), whereas it decreased in the CTR (5.19 ± 1.76 to 4.88 ± 1.19 kb; 0.52 vs. −0.31 kb, $p = 0.048$).**
- **BMI, diastolic blood pressure and total cholesterol remained largely unchanged in both groups ($p > 0.05$).**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE



TAKE HOME MESSAGE:

- **Lifestyle choices may have an impact on the progression of T2DM.**
- **Telomere length, which can be short, very short, or very long, is an important sign of how bodies are aging. It is considered to reflect the health of cells and how well they are functioning.**
- **Shortening of telomeres is accelerated by oxidative stress and inflammation.**
- **Quercetin, a natural plant-derived dietary source, may play a role in protecting against cellular aging and telomere dysfunction in age-related diseases including type 2 diabetes.**

CLINICAL PRACTICE APPLICATIONS:

- Quercetin supplementation may be included as part of the primary health care interventions to support telomere length maintenance in patients with T2DM.
- Quercetin supplementation may also be beneficial for T2DM patients to improve their sleep quality, general well-being perception, blood pressure and blood sugar level regulation.
- TL measurements should be part of the clinical assessments of patients with T2DM for early detection of accelerated TL shortening.

? CONSIDERATIONS FOR FUTURE RESEARCH:

- Larger-scale blinded placebo-controlled studies carried out in multiple research sites or hospitals are needed to assess different doses of the intervention treatment to see how the effect changes with the amount given. These would help to confirm the strengths and reliability of the findings.

CONCLUSIONS:

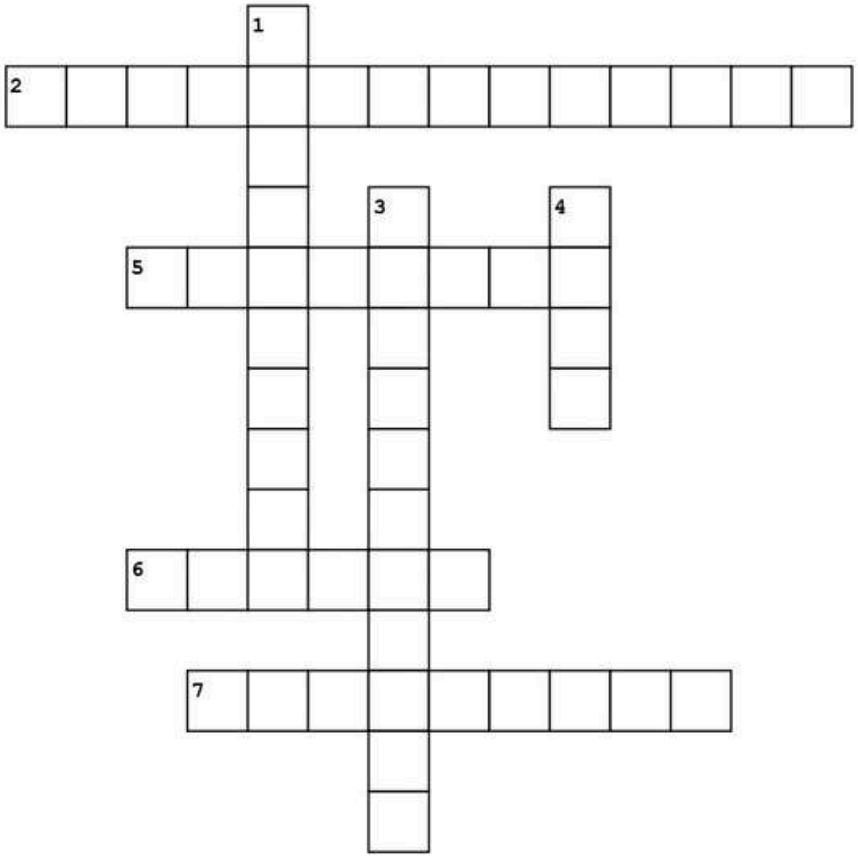
- **The authors concluded that based on quercetin's potential to increase average TL together with better sleep quality and improved wellbeing, blood pressure and blood sugar levels, it can be a complementary plant-based nutritional approach in addition to conventional pharmacological treatment to offer a more integrative care plan to diabetes care.**

EXPERT REVIEWER Sarah Cassar

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

TAKE A BREAK...

NED Science Forum Polyphenol Puzzle



Across

2. This polyphenol in Oliphenolia, the bitter olive fruit water complex, shows modest antioxidant effects in healthy adults

5. Golden milk is made with this

6. This berry has 4 times the level of Anthocyanins compared to blueberries

7. One of the most abundant flavonoids in the diets of nutritional therapists

Down

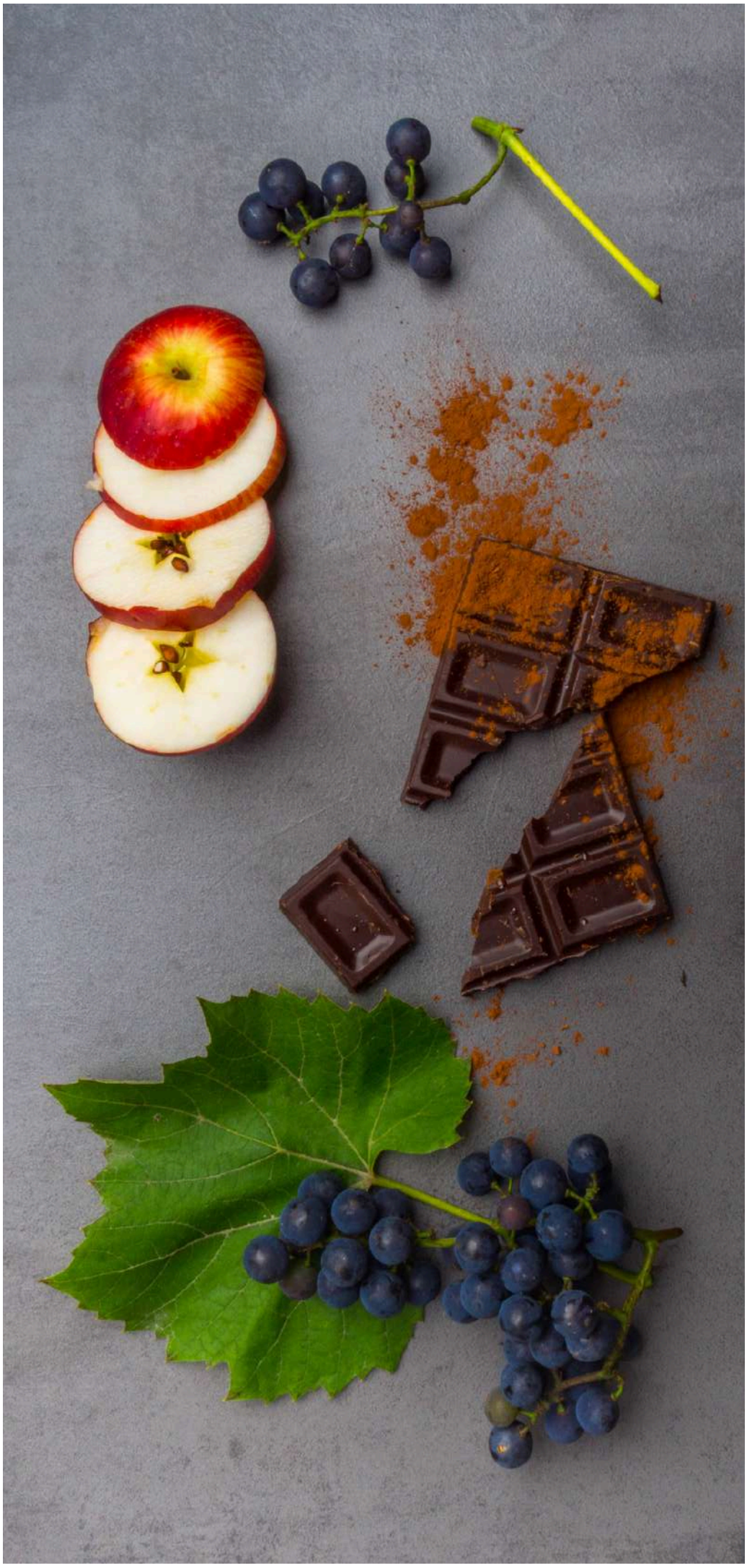
1. Also known as 'smart drugs', these medicinal substances may improve human learning, thinking and memory

3. Commonly used as an excuse to drink red wine

4. Shorthand for green tea polyphenol

RESVERATROL

1 REVIEW



RESVERATROL & TYPE 2 DIABETES

THE EFFICACY OF RESVERATROL SUPPLEMENTATION ON INFLAMMATION AND OXIDATIVE STRESS IN TYPE-2 DIABETES MELLITUS PATIENTS: RANDOMIZED DOUBLE-BLIND PLACEBO META-ANALYSIS

Zhu, P ; Jin, Y ; Sun, J ; Zhou, X
Frontiers in endocrinology. 2024;15:1463027

INTRODUCTION:

- The aim of this meta-analysis was to evaluate the effect of resveratrol on oxidative stress and inflammation in patients with type 2 diabetes mellitus (T2DM).

METHOD:

- Meta-analysis of randomised, placebo-controlled trials of resveratrol in patients with T2DM.
- Where heterogeneity was large ($P \leq 0.1$ and $I(2) > 50\%$), the random effects model was used for pooled analysis, otherwise fixed effects model was used.
- Cochrane Risk of Bias 2 tool was used to assess quality of studies and Grading of Recommendations Assessment, Development and Evaluation (GRADE) tool was employed to assess the certainty of evidence.

RESULTS:

- **6 trials with 7 study arms were included, with a total of 563 participants. Doses used ranged from 40-1000mg resveratrol and duration ranged from 4-24 weeks.**
- **The following biomarkers were significantly improved: C-reactive protein (CRP, SMD = -1.40, 95%CI(-2.60, -0.21), P = 0.02, n=7); lipid peroxide (SMD = -0.99, 95%CI(-1.36, -0.61), P < 0.00001, n=2); 8-isoprostanes (SMD = -0.79, 95%CI(-1.16, -0.42), P < 0.0001, n=2); glutathione peroxidase (SMD = 0.38, 95%CI(0.03, 0.74), P = 0.04, n=2); catalase (SMD = 0.33, 95%CI(0.03, 0.63), P = 0.03, n=3); oxidative stress scores (SMD = -1.62, 95%CI(-2.49, -0.75), P = 0.0003, n=2).**
- **The following biomarkers were not significantly improved: interleukin-6 (IL-6, SMD = -1.35, 95%CI(-2.75, -0.05), P = 0.06, n=5); tumour necrosis factor alpha (SMD = -3.30, 95%CI(-7.47, 0.87), P = 0.12, n=3); superoxide dismutase (SMD = 0.39, 95%CI(-0.26, 1.04), P = 0.24, n=3); total antioxidant capacity (SMD = 0.39, 95%CI(-0.23, 1.00), P = 0.21, n=3); malondialdehyde (SMD = -3.36, 95%CI(-10.30, 3.09), P = 0.29, n=2).**
- **Subgroup analysis of CRP and IL-6 based on dose (< 500mg vs ≥ 500mg) showed no difference of effect with dose. (P > 0.05).**
- **None of the studies reported any adverse events.**
- **Except for one study, the risk of bias of the included studies was assessed as low.**
- **The certainty of the evidence was rated as low or very low.**
- **A funnel plot suggested a publication bias for CRP.**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **The use of resveratrol may be of benefit for patients with T2DM to help reduce oxidative stress and inflammation. However, based on the quality of evidence presented, and limited number of studies, findings should be interpreted with caution.**

CLINICAL PRACTICE APPLICATIONS:

- The use of resveratrol may be considered in patients with T2DM to support an antioxidant and anti-inflammatory protocol. However, based on the quality of evidence presented, and limited number of studies, findings should be interpreted with caution

CONSIDERATIONS FOR FUTURE RESEARCH:

- Larger, high-quality randomised controlled trials to confirm these findings would be of benefit.
- Clinical trials using resveratrol in combination with diet, lifestyle and/or other supplements for a more comprehensive approach and taking into consideration potential synergistic effects as well as background intakes could be considered.

CONCLUSIONS:

- **The authors stated that resveratrol improves oxidative stress and inflammation in patients with T2DM to some extent, but that more large-scale studies are needed to confirm this finding.**

EXPERT REVIEWER Karin Elgar

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

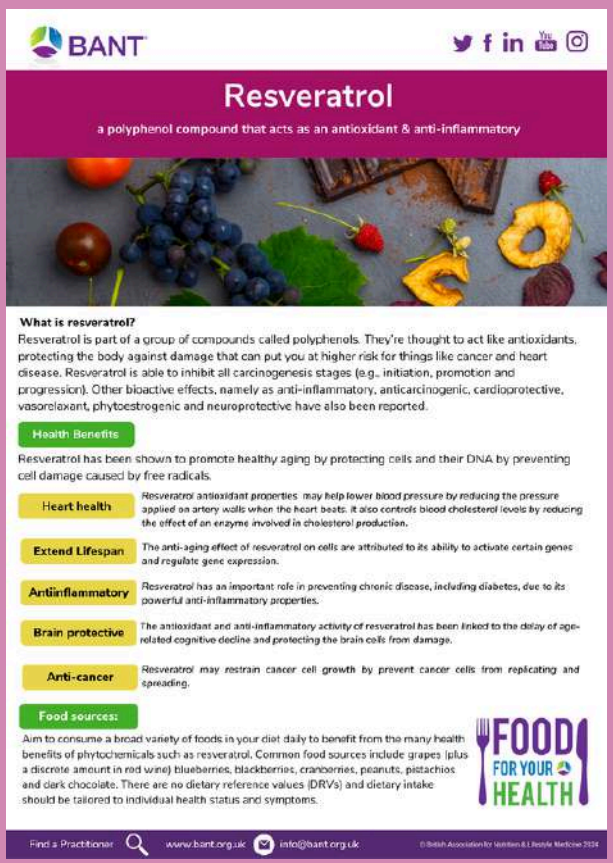
RESVERATROL SCIENCE TAKEAWAYS

RESVERATROL RESOURCES

BANT has developed a dedicated range of resources to complement the personalised nutrition and lifestyle advice given by practitioners in a clinical setting. These resources are open access on our website bant.org.uk and aid further comprehension of nutrition science and clinical interventions.

CLIENT-FRIENDLY GUIDES:

Providing practitioners with health resources to support their clinical recommendations.



Access our resources here.

POLYPHENOLS

8 REVIEWS

MATCHA GREEN TEA ON COGNITION

EFFECT OF MATCHA GREEN TEA ON COGNITIVE FUNCTIONS AND SLEEP QUALITY IN OLDER ADULTS WITH COGNITIVE DECLINE: A RANDOMIZED CONTROLLED STUDY OVER 12 MONTHS

Uchida, K ; Meno, K ; Korenaga, T ; et al.
PloS one. 2024;19(8):e0309287

INTRODUCTION:

Aged-related dementia is a growing global concern with the number of affected patients projected to increase from 57.4 million in 2019 to 152.8 million by 2050. Disease progression is insidious and gradual and, as of yet, no effective treatment or indeed conclusive preventative strategy has been identified. Specific nutritional components of matcha green tea are believed to benefit cognitive function by means of antioxidant and anti-inflammatory properties.

METHODS:

A 12-month randomised, double-blind, placebo-controlled clinical trial assessed the potential of matcha in improving sleep quality and delaying cognitive decline in 99 community-dwelling older adults aged 60–85 years (89 patients completed the trial). Age, sex, and APOE genotype were adjusted for. The participants (n=49) consumed nine capsules of matcha (equivalent to 2 g of matcha) or placebo (n=50) daily at any time. Data collection included standardised cognitive function tests, Pittsburgh sleep quality index scores (PSQI), PET scans for 24 participants (9 male and 15 female), serum, and immunoassay of plasma Aβ1–40 and Aβ1–42 levels.

RESULTS:

- **There were no differences in baseline scores between the two cohorts. After 12-months of intervention a difference of 0.86 (95% CI; -0.002, 1.71) (P = 0.088) in PSQI scores were observed indicating an improvement in sleep quality for the matcha cohort. Significant improvements in social acuity in the neurocognitive domain was furthermore observed (difference; -1.39, 95%CI; -2.78, 0.002) (P = 0.028). There were no observable differences between the cohorts for the other cognitive tests or PET scans.**

CONCLUSIONS:

Even though matcha consumption has no direct impact on the development of dementia, the authors indicate it is a plausible lifestyle improvement strategy that has the potential to improve sleep quality and social acuity that are believed to play a role in the development of late-onset dementia.

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **Dementia pathophysiology is believed to develop in middle age (approximately 45–54 years-old). Nutritional support that focuses on maintenance of cognitive function should therefore be considered when presented with a patient in this age range even when no cognitive impairment symptomatology presents.**
- **Sleep support is fundamental given its association with cognitive decline; early intervention and maintenance of good sleep patterns are therefore crucial at any age.**
- **Signs of facial emotion recognition impairment might be indicative of early stage mild cognitive impairment (MCI) and subjective cognitive decline (SCD). Nutritional support in terms of anti-inflammatory and anti-oxidant nutrients should therefore be part of an intervention dietary strategy in patients presenting with these symptoms.**

CLINICAL PRACTICE APPLICATIONS:

- Matcha green tea powder contains epigallocatechin gallate (anti-oxidant and anti-inflammatory polyphenols) and theanine, an amino acid that is believed to alleviate stress and improve sleep quality.
- The daily intake quantity of matcha was set at 2 g in this study because the amount of matcha in the traditional Japanese tea ceremony, Tea Otemae, is 2 g.
- Matcha tea is therefore an affordable and easily implemented nutritional strategy to improve sleep quality and enhance social perception by providing specific dietary micronutrients for adults of any age.

? CONSIDERATIONS FOR FUTURE RESEARCH:

- Larger scale studies targeted at a more diverse cultural cohort are needed to support the outcome of this study.
- Matcha tea is part of Japanese culture and the efficacy of intake in other cultures are needed to establish quantity reference guidelines.
- The specific effects of matcha tea intake on dementia and Alzheimer biomarkers need further investigation.

EXPERT REVIEWER Wilma Kirsten

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

POMEGRANATE ON OBESITY INDICES

THE EFFECTS OF POMEGRANATE CONSUMPTION ON OBESITY INDICES IN ADULTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Bahari, H ; Pourreza, S ; Goudarzi, K ; Mirmohammadali, SN ; Asbaghi, O ; Kolbadi, KSH ; Naderian, M ; Hosseini, A
Food science & nutrition. 2024;12(2):641-660

INTRODUCTION:

- This systematic review and meta-analysis aimed to evaluate the effects of pomegranate supplementation on liver enzymes in adults with various medical conditions.

METHOD:

- Systematic review and meta-analysis of randomised controlled trials (RCTs) of adults who consumed pomegranate for at least 2 weeks, reporting liver enzymes, aspartate aminotransferase (AST), alanine transaminase (ALT), and gamma glutamyl transferase (GGT) as an outcome.
- Study quality was assessed with the Cochrane Risk of Bias (RoB) tool and certainty of evidence was evaluated with GRADE.

RESULTS:

- **Nine articles (12 study arms, 425 participants) were included in the review.**
- **Populations included patients with cardiometabolic disease, pulmonary disease, and athletes.**
- **Pomegranate interventions (2-12 weeks) used juices, extracts and seed oil.**
- **Pomegranate significantly reduced GGT compared to controls (WMD -5.43; 95% CI −7.78, −3.08; $p<0.001$; n=3), with no significant heterogeneity ($P=0.024$, $I^2=73.1\%$). No significant effects were observed for ALT (WMD -1.13; CI −4.18, 1.91; p=0.466; n=10) or AST (WMD -0.58; CI −2.58, 1.42; p=0.570; n=12), with substantial heterogeneity (ALT: $P<0.001$, $I^2=87.5\%$; AST: $P<0.001$, $I^2=92.8\%$).**
- **Subgroup analysis showed significant benefits for ALT with durations of ≥8 weeks (WMD -5.31 (CI −8.28, −2.34) $p<0.001$, n=4) and in patients with metabolic disorders (WMD -4.29 (CI −7.21, −1.37) p=0.004, n=6); and for AST with durations of ≥8 weeks (WMD -4.06 (CI -5.73, −2.38) $p<0.001$, n=5), in obese patients (WMD -2.15 (CI -4.18, −0.11) $p<0.038$, n=5) and patients with metabolic disorders (WMD -2.88 (CI -4.64, −1.11) $p<0.001$, n=7),**
- **RoB was good for 6, fair for 1 and bad for 2 studies. Certainty of evidence was considered very low for ALT and AST, and as high for GGT. Limitations included small sample sizes, short durations, and varied pomegranate formulations.**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **Whilst the evidence is limited, pomegranate intake for at least 8 weeks may help reduce liver enzymes in patients with metabolic disorders or obesity.**

CLINICAL PRACTICE APPLICATIONS:

- Pomegranate intake for at least 8 weeks may have a beneficial effect on liver enzymes in patients with metabolic disorders and obesity. However, based on the quality of evidence presented, and limited number of studies, findings should be interpreted with caution.

? CONSIDERATIONS FOR FUTURE RESEARCH:

Larger, longer-terms RCTs in patients with elevated liver enzymes and using standardised pomegranate supplements would be of value.

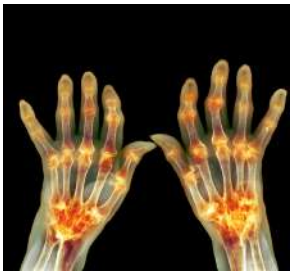
CONCLUSIONS:

- **While pomegranate had no overall effect on liver enzymes in general populations, it may benefit individuals with elevated liver enzyme risk, particularly those with metabolic disorders or obesity when taken longer term.**

EXPERT REVIEWER Karin Elgar

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

PLANTS AND R. ARTHRITIS



EFFECTS OF PLANT ACTIVE SUBSTANCES IN RHEUMATOID ARTHRITIS-A SYSTEMATIC REVIEW AND NETWORK META-ANALYSIS

Peng, Q ; Wang, J ; Li, K ; Xia, C ; Yao, C ; Guo, Q ; Gong, X ; Tang, X ; Jiang, Q
Frontiers in pharmacology. 2025;16:1536023

INTRODUCTION:

- Rheumatoid arthritis (RA) is an autoimmune disorder leading to inflammation, joint damage and deformity.
- This systematic review and meta-analysis aimed to assess the impact of plant substances on Visual Analogue Scale (VAS), inflammatory markers, Swollen Joint Count (SJC), Tender Joint Count (TJC) and Disease Activity Score on 28 joints (DAS28) in individuals with RA.

METHOD:

- This study adhered to the PRISMA guidelines.
- 18 randomised controlled trials with a total of 1,674 patients were included in the final analysis.
- Interventions assessed were curcumin (6 studies), olive extract (1 study), total glucosides of paeony (TGP) (2 studies), pomegranate extract (1 study), tripterygium wilfordii root extract (TwRE) (2 studies), baicalin (1 study), sesamin (1 study), quercetin (1 study), resveratrol (1 study), sinomenine (SIN) (1 study) and puerarin (1 study).

RESULTS:

- **None of the plant substances were more effective than the control group in lowering VAS scores, however quercetin was the most effective plant compound based on probability ranking (SUCRA: 67.3%).**
- **None of the interventions were superior to the routine measures in lowering inflammatory markers. Curcumin was the most effective plant active substance intervention based on probability ranking (SUCRA: 72.3%).**
- **Compared to the placebo, curcumin was superior in lowering DAS28 (MD = −1.33, 95% CI (−2.30, −0.36)).**
- **The probability ranking placed resveratrol highest for reducing DAS28 (SUCRA: 73.3%).**
- **Curcumin demonstrated greater reductions in SJC than the placebo (MD = −4.41, 95% CI (−7.50, −1.31)).**
- **The probability ranking of the plant active substance interventions identified curcumin as the highest for reducing SJC (75.6%).**
- **Curcumin was superior to placebo in reducing TJC (MD = −5.02, 95% CI (−8.25, −1.80)).**
- **The probability ranking of plant active substance interventions identified curcumin as the highest for reducing TJC (SUCRA: 76.2%).**
- **Curcumin was most effective in reducing SJC, TJC and inflammatory markers. Quercetin was more effective in reducing VAS scores. Resveratrol was more effective in improving DAS28.**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **Quercetin, curcumin and resveratrol are low cost treatments that may help in the reduction of RA symptoms.**

CLINICAL PRACTICE APPLICATIONS:

- Quercetin (500mg/day) may help to reduce pain intensity in individuals with RA.
- Curcumin (80-500mg/day) may help to reduce inflammation and disease severity and activity in individuals with RA.
- Resveratrol (1g/day) may be effective in reducing RA activity.

? CONSIDERATIONS FOR FUTURE RESEARCH:

- The studies included in the analysis utilised single plant compounds in the intervention groups. Further research assessing the impact of a combination of plant active substances may provide insights into any potential synergistic or additive effects.
- Study durations ranged from 6 to 24 weeks. Longer studies may help to identify the long-term benefit of plant active substances in RA.

EXPERT REVIEWER Daniel Quinones

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

POLYPHENOLS ON HELICOBACTER P.

EFFECT OF POLYPHENOL COMPOUNDS ON HELICOBACTER PYLORI ERADICATION: A SYSTEMATIC REVIEW WITH META-ANALYSIS

Wang, Q ; Yao, C ; Li, Y ; Luo, L ; Xie, F ; Xiong, Q ; Feng, P
BMJ open. 2023;13(1):e062932

INTRODUCTION:

The authors highlight that Helicobacter pylori (H. pylori) has been classified as a group 1 carcinogen and H. pylori infection is considered the leading cause of gastric cancer. More than half the world's population is infected with H. pylori and recurrence rates have increased over the past decade. Several studies indicate that polyphenol compounds positively affect H. pylori eradication. However, experimental and clinical studies have shown different results.

METHOD:

- This is the first meta-analysis to assess the efficacy and safety of polyphenol compounds (curcumin, cranberry, garlic, liquorice and broccoli) in eradicating H. pylori.
- A total of 12 RCTs with 1251 adult participants were finally included. Two studies evaluated the efficacy of curcumin, four studies evaluated the efficacy of cranberry, four studies assessed the efficacy of liquorice, one study evaluated the efficacy of garlic, and one study assessed the efficacy of broccoli.
- Subgroup analysis of different treatment schemes on the eradication rate of H.pylori infection included: three studies which compared the effects of polyphenols with placebo; six studies compared the effects of polyphenols along with triple therapy; two studies compared the effects of polyphenol plus triple therapy with bismuth triple therapy; one study compared the effects of polyphenols plus quadruple regimen with quadruple regimen plus placebo.

RESULTS:

- **The results indicate that polyphenols are conducive to H. pylori eradication. The total eradication rate of H.pylori in the polyphenol compounds group was significantly higher than in the group without polyphenol compounds (RR 1.19, 95% CI 1.03 to 1.38, p=0.02).**
- **In subgroup analyses, eradication rate with polyphenol therapy was superior to that without polyphenol therapy in the polyphenols versus placebo subgroup (RR 4.23, 95% CI 1.38 to 12.95, p=0.01) and in the polyphenols plus triple therapy versus triple therapy subgroup (RR 1.11, 95% CI 1.01 to 1.22, p=0.03).**
- **No significant differences existed between the five different polyphenol compounds analysed.**
- **The most frequent adverse effects of polyphenol compounds included diarrhoea, headache and vomiting. However, there were no differences regarding side effects between the polyphenol compounds and control groups (RR 1.47, 95% CI 0.83 to 2.58, p=0.18).**

See limitations here

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **This is the first meta-analysis of polyphenol efficacy and safety in eradicating H. pylori.**
- **The results suggest that polyphenol compounds (curcumin, cranberry, garlic, liquorice and broccoli) can improve eradication rates.**
- **Furthermore, polyphenol compounds combined with standard triple therapy for H.pylori infection can significantly improve eradication (p=0.03).**
- **No evidence for an increased rate of side effects could be found.**
- **Due to the low quality of the included studies, these results should be interpreted with caution.**

CLINICAL PRACTICE APPLICATIONS:

- Infection with H.pylori is a major pathogenic factor for many gastrointestinal conditions such as chronic atrophic gastric ulcers and has been linked with several extra-digestive diseases such as atherosclerosis, Alzheimer's disease and rosacea.
- The efficacy of standard 1-week triple therapy containing clarithromycin and either metronidazole or amoxicillin combined with a PPI has decreased dramatically, with eradication rates as low as 50%–70%. Antibiotic resistance and patient compliance are the major causes of this decline.
- Concomitant, sequential and hybrid therapies are also recommended for treating H. pylori infection. However, there are currently few, if any, regimens which consistently achieve eradication rates exceeding 90%. In this analysis H. pylori eradication rates ranged from 54.4% to 91.7% in the polyphenol treatment groups.
- The results of this analysis indicate that polyphenol compounds can significantly improve H. pylori eradication rates and might be more effective during polyphenol treatment combined with standard triple therapy.
- No evidence for an increased rate of side effects could be found.
- Due to the low quality of the included studies, these results should be interpreted with caution.

? CONSIDERATIONS FOR FUTURE RESEARCH:

- While a few included studies mention doses of these polyphenol compounds for eradicating H. pylori, it was not an outcome analysed in this meta-analysis and therefore future research on this would help to clarify appropriate dosages.
- Adverse reactions and safety observations warrant further study.
- More large-scale, high-quality clinical trials should be conducted to provide a stronger, evidence-based foundation for guiding clinical medication. In particular in relation to more studies on different treatment schemes and species.
- Finally, the polyphenol contents of each food before and after the eradication period from each manuscript included in the analysis could not be determined which could be a confounding factor. Future studies should address this.

EXPERT REVIEWER Georgie Murphy

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

MD, CURCUMIN & RESVERATROL

EFFECTS OF MEDITERRANEAN DIET, CURCUMIN, AND RESVERATROL ON MILD-TO-MODERATE ACTIVE ULCERATIVE COLITIS: A MULTICENTER RANDOMIZED CLINICAL TRIAL

Erol Doğan, Ö ; Karaca Çelik, KE ; Baş, M ; Alan, EH ; Çağın, YF
Nutrients. 2024;16(10)

INTRODUCTION:

- Ulcerative colitis (UC) is a chronic inflammatory condition with alternating periods of flare-ups and remission. UC can cause diarrhoea, rectal bleeding, pain, weight loss, and fever. This study aimed to investigate the effects of the Mediterranean diet (MD), combined with curcumin and resveratrol supplementation, on disease activity, serum inflammatory markers, and quality of life in patients with mild-to-moderate active UC.

METHOD:

- A prospective multi-centre three-arm RCT with MD, MD + curcumin, and MD + resveratrol groups.
- The control group (n=16) were provided with the MD intervention for 8 weeks.
- Curcumin participants (n=16) received 1600 mg/day of curcumin divided into two capsules twice daily.
- Resveratrol participants (n=16) received 500 mg/day of resveratrol divided into two capsules twice daily.
- All participants adhered to the same dietary protocol. Dietary intervention was tailored to each individual's physical activity levels (PALs), resting metabolic rate, and individual requirements following the ESPEN guidelines.
- Anthropometric measurements, Truelove–Witts Index, Short Form-36, Inflammatory Bowel Disease Questionnaire (IBDQ), Mediterranean Diet Adherence Scale (MEDAS), and complete blood count, C-reactive protein (CRP) levels, and erythrocyte sedimentation rate (ESR) were taken at baseline and after 8 weeks of interventions.

RESULTS:

- **Between-group comparisons revealed no significant difference in all parameters except for the lower levels of pain-related quality of life reported by the MD + R group ($p < 0.05$).**
- **Within-group comparisons showed that health-related quality of life improved across all groups ($p < 0.05$).**
- **Between-group analysis revealed no statistically significant differences in the hemogram and inflammatory biomarkers.**
- **Within-group comparisons showed that all groups had a significant decrease in CRP and ESR levels.**
- **The MD + C group achieved improved systemic symptoms scores ($p < 0.05$).**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **The Mediterranean diet is a safe, effective strategy for improving inflammation, symptoms, and quality of life in mild-to-moderate UC.**
- **While curcumin and resveratrol may be used as optional adjuncts, they did not enhance outcomes beyond the diet alone in this small study.**
- **Further research is required.**

CLINICAL PRACTICE APPLICATIONS:

- The MD is an effective and safe intervention to be used in clinical practice in individuals with UC.
- Curcumin and resveratrol may be used as optional adjuncts but no summation of effects was observed in this study.
- Clinicians should emphasise MD adherence in UC and use tools like the MEDAS score to track and encourage compliance.

CONSIDERATIONS FOR FUTURE RESEARCH:

- Larger RCTs are required with more diverse participants and longer intervention periods.
- Further studies should include faecal calprotectin and proinflammatory cytokine measures and endoscopic imaging to enhance the comprehensiveness of results.
- This study was limited to individuals with mild-to-moderate active disease, further research could compare findings to individuals in remission or with severe active disease.

CONCLUSIONS:

- **The MD was effective in decreasing CRP and ESR levels, and enhancing the quality of life of individuals with mild-to-moderate active UC. Adding curcumin or resveratrol did not lead to greater or additive benefits beyond the MD alone.**

EXPERT REVIEWER Michelle Barrow DProf

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: B: Systematic reviews including RCTs of limited number

POLYPHENOLS IN R. ARTHRITIS

EFFICACY AND SAFETY OF DIETARY POLYPHENOLS IN RHEUMATOID ARTHRITIS: A SYSTEMATIC REVIEW AND META-ANALYSIS OF 47 RANDOMIZED CONTROLLED TRIALS

Long, Z ; Xiang, W ; He, Q ; et al.
Frontiers in immunology. 2023;14:1024120

INTRODUCTION:

- The aim of this systematic review and meta-analysis of RCTs was to evaluate the impact of dietary polyphenols on markers and symptoms of rheumatoid arthritis (RA).

METHOD:

- This systematic review and meta-analysis was conducted according to PRISMA guidelines and is registered with PROSPERO.
- RCTs examining patients with a diagnosis of RA, with a treatment arm looking at dietary polyphenols, were included.
- 47 RCTs were included in the final analysis, involving 15 dietary polyphenols and 3,503 participants.
- Outcome measures included disease activity scores, serum inflammatory markers, and oxidative stress markers

RESULTS:

- **Meta-analysis was possible for total glucosides of Paeony (23 RCTs), tea polyphenols (2 RCTs), crocus sativus L. extract (2 RCTs) and curcumin (5 RCTs).**
- **Total glucosides of paeony. The following markers were lower in the treatment arm compared to controls: disease activity score in 28 joints (DAS28) [WMD=-0.92 95%CI (-1.52, -0.31), P=0.003]; C-reactive protein (CRP) [SMD=-1.32 95%CI (-1.81, -0.83), P<0.00001]; erythrocyte sedimentation rate (ESR) [WMD=6.44 95%CI (=9.24, -3.63), P<0.00001]; and rheumatoid factor (RF) [SMD=-2.01 965%CI (-3.01, -1.01) P,0.0001].**
- **Tea polyphenols: The following markers were lower in the treatment arm compared to controls: DAS28 [WMD=-1.76 95%CI (-2.71, -0.81), P=0.0003]; and CRP [WMD=-1.83 95%CI (-3.08, -0.59), P=0.004].**
- **Crocus sativus L. extract. No statistical significance was found for the following markers: DAS28 [WMD=–0.48 95%CI (-1.31, 0.35), P=0.26]; ESR [WMD=-4.01 95%CI (-11. 80, 3.78), P=0.31].**
- **Curcumin. The following markers were lower in the treatment arm compared to controls: DAS28 [WMD=- 1.10 95%CI (-1.67, -0.53), P=0.0002]; CRP [WMD=-0.35 95%CI (-0.55, -0.15), P=0.0005]; ESR [WMD=-54.67 95%CI (-88.32, -21.02), P=0.001]; and RF [WMD=-51.30 95%CI (-60.59, -42.01), P<0.00001].**
- **Whilst statistically significant results were reported for other polyphenols, these were based on single, small trials and are therefore not summarised in this expert review.**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

TAKE HOME MESSAGE:

- **Existing evidence on dietary polyphenols shows potential benefit for reducing RA disease activity and improving associated inflammatory and oxidative stress markers.**
- **However, the number of RCTs on dietary polyphenols and RA is limited and the trial size is small and subject to bias. Therefore, interpretation of these results needs to be made with caution.**

CLINICAL PRACTICE APPLICATIONS:

- Whilst the outcomes of this research are based on a small number of studies with a high risk of bias, healthcare practitioners working with RA patients can use the results to encourage intake of a broad range of dietary polyphenols from foods as one strategy to reduce inflammation and RA disease activity.
- Supplementation with total glucosides of Paeony, tea polyphenols, crocus sativus L. extract and curcumin at therapeutic doses could be considered as part of a protocol when working with RA patients.

CONSIDERATIONS FOR FUTURE RESEARCH:

- Larger clinical trials of polyphenols and RA, with both single and multiple phenolic compounds, are required to further knowledge in this area.

CONCLUSIONS:

- **Dietary polyphenols appear to reduce RA disease activity, lower inflammation and improve oxidative stress markers, however further research is needed.**

EXPERT REVIEWER Clare Grundel

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

POLYPHENOLS ON MEMORY FUNCTION

EFFECT OF POLYPHENOL SUPPLEMENTATION ON MEMORY FUNCTIONING IN OVERWEIGHT AND OBESE ADULTS: A SYSTEMATIC REVIEW AND META-ANALYSIS

Farag, S ; Tsang, C ; Al-Dujaili, EAS ; Murphy, PN
Nutrients. 2024;16(4)

INTRODUCTION:

- This review focused on the effect of polyphenol supplementation on short-and long-term memory in overweight and obese individuals. Research highlights that overweight middle-aged individuals are at increased risk of cognitive impairment and Alzheimer's disease (likely associated with chronic inflammation, including neuroinflammation).

METHOD:

- A systematic search of PubMed/Medline, PsycInfo and Scopus was conducted for randomised controlled trials (RCTs) up to August 2023. Only English language studies were included.
- Inclusion criteria (PICOS) – Overweight or obese adults >18 years, Body Mass Index ≥ 25kg/m2, only acute and/or chronic polyphenol-rich supplementation, control groups with food, juice or placebo and memory function tasks included.
- Of 3330 publications, 24 met the inclusion criteria.
- 14 studies included both immediate and delayed retrieval tasks; five assessed delayed retrieval and five immediate retrieval.
- Five crossover (CO) studies reported the acute effects of supplementation with single dosage up to 8 hours after administration and 19 between-participants design RCTs (BTW-P) examined chronic supplementation administered for up to 2.5 years.
- 2336 participants were included, with a mean age > 60.

RESULTS:

Immediate retrieval:

- **Level one meta-analyses - 16 RCT's included. The weighted mean effect size for this random-effects analysis was significant (Hedges' g= 0.170; 95% CI 0.007- 0.333; z = 2.044, p = 0.041), suggesting that polyphenol supplementation positively impacted immediate memory retrieval.**
- **Level two meta-analyses – results from BTW-P supported this finding (g = 0.226, z = 2.209, p = 0.027), whereas CO studies did not (g = −0.007, z = −0.052).**
- **Level three meta-analyses – by polyphenol type, were borderline nonsignificant (flavonoids) and nonsignificant (isoflavone, and resveratrol), suggesting a potential general benefit from polyphenol supplementation.**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

RESULTS CONTINUED:

Delayed retrieval:

- **Level one meta-analyses - 16 studies included (Hedges' g = 0.022; 95% CI −0.066-0.111; z = 0.499).**
- **Level two meta-analyses - BTW-P results (g = 0.041, z = 0.854). CO results (g = 0.113, z = −0.867).**
- **All results were nonsignificant, suggesting that polyphenol supplementation had no effect on delayed memory retrieval.**

TAKE HOME MESSAGE:

- **While it was not possible to identify which polyphenol (flavonoids, isoflavone and resveratrol) was the most effective, chronic polyphenol supplementation may benefit memory recall (immediate) in individuals who are overweight or obese and aged 60 or above.**

CLINICAL PRACTICE APPLICATIONS:

- Mild cognitive impairment is a transitional stage between normal brain function and dementia. While the research is still not conclusive, given the inflammatory risks associated with being overweight or obese, chronic polyphenol supplementation including flavonoids, isoflavone and resveratrol, may benefit these client's, especially those who are > 60 years of age and have a family history of dementia.

CONSIDERATIONS FOR FUTURE RESEARCH:

- While the mean age of the study was >60, participants included could be of any age. Further studies could include reviewing the benefits of polyphenol supplementation on younger overweight/obese individuals to understand the impact it has on memory function.
- Since studies included in the review did not all make a distinction between immediate and delayed retrieval, future research would benefit from more defined criteria and larger samples sizes.
- More specific detail around polyphenol supplementation, including phenolic content would be recommended.

CONCLUSIONS:

- **Chronic polyphenol supplementation may enhance immediate memory retrieval versus placebo.**

EXPERT REVIEWER Nicky Ester

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

DARK CHOCOLATE & INFLAMMATION

EFFECT OF DARK CHOCOLATE/ COCOA CONSUMPTION ON OXIDATIVE STRESS AND INFLAMMATION IN ADULTS: A GRADE-ASSESSED SYSTEMATIC REVIEW AND DOSE-RESPONSE META-ANALYSIS OF CONTROLLED TRIALS

Behzadi, M ; Bideshki, MV ; Ahmadi-Khorram, M ; Zarezadeh, M ; Hatami, A
Complementary therapies in medicine. 2024;84:103061

INTRODUCTION:

- This systematic review and dose-response meta-analysis provides a comprehensive overview of the controlled trials (CTs) examining the effects of dark chocolate (DC)/cocoa on oxidative stress and inflammation biomarkers in adults.

METHOD:

Databases including PubMed, Web of Science, and Scopus, were searched for relevant studies through April 2024.

The method was conducted according to PRISMA guidelines.

Studies were selected on the following inclusion criteria:

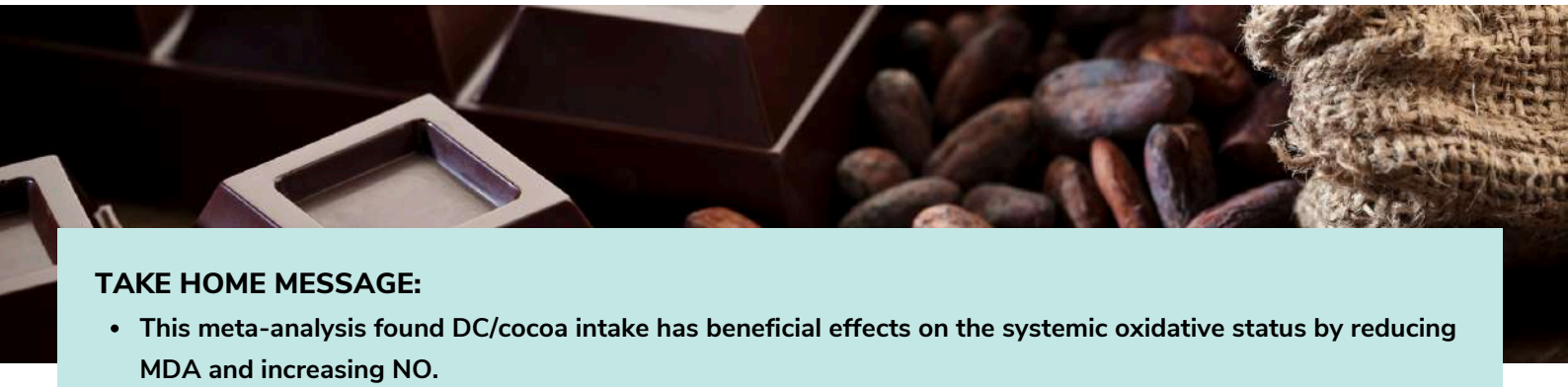
- Results from controlled trials (CTs)
- Interventions using DC or cocoa with duration of at least two weeks
- Adult participants (18 ≤ years old)
- Studies assessing C-reactive protein (CRP), interleukin-6 (IL-6), tumor necrosis factor-alpha (TNF-α), malondialdehyde (MDA), nitric oxide (NO), P-selectin, E-selectin and thiobarbituric acid reactive substances (TBARS) in adults were included.

Based on the random-effects model, weighted mean differences (WMDs), standard mean differences (SMDs) and 95 % confidence intervals (CIs), sensitivity, sub-group, meta-regression and dose-response analyses were calculated.

RESULTS:

- **Thirty-three eligible CTs with 1379 participants were included.**
- **Trials were conducted on participants with cardiovascular disease (CVD), overweight and obesity, T2DM, hemodialysis, cancer, metabolic syndrome, HIV, and hypercholesterolemia.**
- **DC/cocoa significantly reduced MDA (SMD: −0.69, 95 %CI: −1.17, −0.2, p = 0.005) and increased NO levels (SMD: 2.43, 95 %CI: 1.11,3.75, p < 0.001).**
- **No significant effects on the other outcomes were found.**
- **Greater anti-inflammatory effects occurred at higher flavonoid doses (>450 mg/day) and for shorter durations (≤4 weeks), in the non-healthy participants.**
- **Non-linear dose-response relationships between cocoa dosage and CRP level and also between flavonoid dosage and IL-6 level.**

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE



TAKE HOME MESSAGE:

- **This meta-analysis found DC/cocoa intake has beneficial effects on the systemic oxidative status by reducing MDA and increasing NO.**

CLINICAL PRACTICE APPLICATIONS:

- While, anti-inflammatory effects were observed in the higher dosages (> 450 mg/d) and shorter duration (≤ 4 weeks), the number of studies were not enough to draw conclusions and the certainty of evidence was not high for most outcomes.

CONSIDERATIONS FOR FUTURE RESEARCH:

- Future studies should assess the side effects/toxicity of cocoa and its products in high dosages.
- More high-quality future trials with appropriate design (considering randomisation, blinding assessment and independent testing for purity and potency) and larger sample sizes are needed to indicate the effect of DC/cocoa on inflammation and oxidative stress.
- The main limitation was the heterogeneity of enrolled studies.
- Differences in duration of trials ranged from 2-12 weeks and type of cocoa supplementation, as well as the preparation method used, content and compositions.
- Age, gender, pharmaceuticals management, genetic and population lifestyle variation, may have influenced the results and should be considered when interpreting them.

CONCLUSIONS:

- **DC/cocoa may improve systemic oxidative status and inflammation in adults. However, further studies should be performed to determine its benefits.**

EXPERT REVIEWER Mays Al-Ali

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: A: Meta-analyses, position-stands, randomized-controlled trials (RCTs)

POLYPHENOLS & FATTY LIVER

POLYPHENOL INTERVENTION AMELIORATES NON-ALCOHOLIC FATTY LIVER DISEASE: AN UPDATED COMPREHENSIVE SYSTEMATIC REVIEW

Ranneh, Y ; Bedir, AS ; Abu-Elsaoud, AM ; Al Raish, S
Nutrients. 2024;(23)

TAKE HOME MESSAGE:

Polyphenol supplements show potential for the prevention and management of non-alcoholic fatty liver disease. However, current research has shown mixed results. Further clinical trials are needed to confirm these findings as well as provide optimal dose and duration.

INTRODUCTION:

Non-alcoholic fatty liver disease (NAFLD) is a metabolic disorder estimated to affect 30.5% of people worldwide. There are currently no pharmacological interventions. The aim of this study was to critically assess evidence for the use of polyphenol supplementation for the prevention and management of NAFLD.

METHOD:

- 29 randomised controlled trials (RCTs) with a total population of 1840 participants aged 18-70 years, diagnosed with NAFLD were included in this systematic review.
- Study durations ranged from 8-48 weeks. Intervention groups included between 10-69 patients.
- 11 phenolic compounds were examined: turmeric, curcumin, resveratrol, anthocyanins, naringenin, genistein, catechin, green tea extract, hesperidin, silybin and silymarin. These were taken orally in capsule form, either as single or combined compounds.
- Measurement markers included: Liver enzymes (AST, ALP, ALT, GGT); Lipid profile (total cholesterol (TC), triglycerides (TG), low-density lipoprotein cholesterol (LDL-C), high-density lipoprotein cholesterol (HDL-C)); Inflammation markers (TNF-alpha, CRP, IL-6, NAFLD score); Homeostasis Model Assessment-Insulin Resistance (HOMA-IR); and body mass index (BMI).
- The method was conducted according to PRISMA guidelines.

CONCLUSION:

Supplementation with turmeric and curcumin may support the reduction of liver enzymes and inflammatory markers, and improve lipid profiles, insulin resistance and NAFLD scores in patients with NAFLD. The results for other polyphenols were inconsistent across studies.

HOW TO BRING THIS RESEARCH INTO YOUR CLINICAL PRACTICE

Results:

- **5/7 trials showed turmeric and curcumin significantly reduced ALT, AST and GGT.**
- **7/14 trials showed significant improvements in TG, LDL-C, HDL-C, TC following supplementation with turmeric, curcumin, green tea extract, hesperidin and silymarin.**
- **5/11 studies reported a significant reduction in TNF-@ levels after supplementation with curcumin, genistein, resveratrol and hesperidin.**
- **Green tea extract and hesperidin reduced CRP in 3/7 studies.**
- **Genistein significantly reduced IL_6 in 1 study.**
- **5/7 studies reported NAFLD scores were significantly improved by curcumin, naringenin, silymarin and silybin.**
- **Turmeric, curcumin, genistein, green tea extract, hesperidin, resveratrol and silybin improved HOMA-IR values in 9 trials.**
- **In 9/16 trials BMI decreased following supplementation with turmeric, curcumin, genistein, green tea extract, hesperidin, naringenin and silymarin.**

CLINICAL PRACTICE APPLICATIONS:

- Obesity and insulin resistance are risk factors for NAFLD. A diet rich in polyphenols may help to decrease the inflammatory cascades and oxidative stress that are associated with these conditions.
- A Mediterranean diet is naturally high in polyphenols; however, bioavailability varies greatly.
- Supplements in liposomal and nanoparticle form can enhance absorption and availability.

? CONSIDERATIONS FOR FUTURE RESEARCH:

- Larger trials with longer durations and standardised interventions are needed to confirm the results.
- Dose and duration of intervention need to be established.
- Baseline differences between developing and developed countries may mean that the results may not be generalised to a global population.

EXPERT REVIEWER Gail Brady

CONFLICTS OF INTEREST: None
EVIDENCE CATEGORY: B: Systematic reviews including RCTs of limited number

POLYPHENOL SCIENCE TAKEAWAYS

POLYPHENOL RESOURCES

BANT has developed a dedicated range of resources to complement the personalised nutrition and lifestyle advice given by practitioners in a clinical setting. These resources are open access on our website bant.org.uk and aid further comprehension of nutrition science and clinical interventions.

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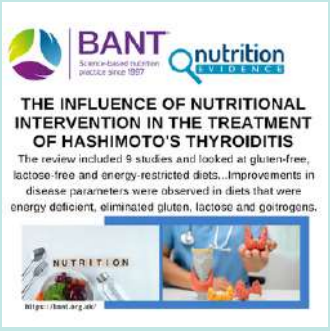

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