

Efficacy of Anthocyanins on Cardiometabolic Health: An Umbrella Review of Meta-Analyses of Randomized Controlled Trials and Observational Studies.

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REVIEW TITLE AND BASIC DETAILS

Review title

Efficacy of Anthocyanins on Cardiometabolic Health: An Umbrella Review of Meta-Analyses of Randomized Controlled Trials and Observational Studies.

Condition or domain being studied

Cardiovascular health, metabolic health.

Rationale for the review

Non-communicable diseases (NCDs) remain the leading global health burden; according to the World Health Organization (WHO), seven out of the ten leading causes of death globally in 2021. Today, ischemic heart disease ranks first, and type 2 diabetes mellitus (the most common form of diabetes) is estimated to affect around 4.2 billion people worldwide. The pharmacological treatments for these chronic diseases are on the rise, often presenting clinical side effects and financial burdens on patients, highlighting the need for effective and accessible preventive strategies. A mounting body of evidence suggests anthocyanins, a bioactive subclass of flavonoids within the polyphenol family, have potential in reducing the risk of type 2 diabetes, cardiovascular mortality, coronary heart disease, and stroke. Therefore, this umbrella review will assess the credibility and certainty of associations between anthocyanin consumption and cardiometabolic health outcomes in adults by synthesizing the evidence from meta-analyses of randomized controlled trials and observational studies.

Review objectives

What is the impact of anthocyanin consumption on cardiometabolic health in humans?

This umbrella review will systematically assess the credibility and certainty of associations between anthocyanin consumption and cardiometabolic health outcomes in adults, by synthesizing the evidence from meta-analyses of randomised controlled trials and observational studies.

Keywords

Cardiometabolic health; Anthocyanins; Umbrella review; Cardiovascular disease; Metabolic syndrome

Country

United Kingdom; Brazil; Italy; North Macedonia; United States of America

ELIGIBILITY CRITERIA

Population

Included

Adults aged 18 years or older

Excluded

Children and adolescents (under 18 years old).

Intervention(s) or exposure(s)

Included

Anthocyanin-rich dietary sources, or anthocyanin-rich extracts, or pure anthocyanin compounds, anthocyanin supplements.

No restrictions on doses. If dose is not reported it will be estimated using Phenol Explorer and USDA database.

Comparator(s) or control(s)**Included**

Placebo.

Lower anthocyanin intake.

No intake.

Study design

Both randomized and nonrandomized study types will be included.

Included

Meta-analysis of randomized controlled trials designed to assess the effects of anthocyanin intake on cardiometabolic health.

Meta-analysis of observational studies designed to assess the effects of anthocyanin intake on cardiometabolic health.

Only published peer-reviewed meta-analyses, as defined in the Cochrane Handbook for Systematic Reviews of Interventions, will be included in this umbrella review.

Excluded

Supplemental primary studies (individual RCTs or observational studies) will not be included.

Systematic reviews will not be included.

The following will also not be included: review papers that are not systematic; systematic reviews without meta-analysis, umbrella reviews, reviews of mechanistic studies; co-interventions; animal studies; in-vitro studies; in-silico studies, ecological studies, conference abstracts, protocol manuscripts.

Context

Only published peer-reviewed meta-analyses, as defined in the Cochrane Handbook for

Systematic Reviews of Interventions, will be included in this umbrella review

TIMELINE OF THE REVIEW

Date of first submission to PROSPERO

11 February 2026

Review timeline

Start date: 2 February 2026. End date: 2 February 2027.

Date of registration in PROSPERO

11 June 2026

AVAILABILITY OF FULL PROTOCOL

Availability of full protocol

A full protocol has been written and uploaded to PROSPERO. The protocol will be made available after the review is completed.

SEARCHING AND SCREENING

Search for unpublished studies

Only published studies will be sought.

Main sources that will be searched

The main databases to be searched are *CENTRAL - Cochrane Central Register of Controlled Trials*, *CLIB - The Cochrane Library*, *Embase - Embase via Ovid*, *PubMed* and *Scopus*.

Other important or specialist databases that will be searched

Web of Science

Search language restrictions

There are no language restrictions.

Search date restrictions

There are no search date restrictions.

Other methods of identifying studies

No other methods will be used.

Link to search strategy

A full search strategy has been uploaded to PROSPERO. The PDF may be accessed through this link <https://www.crd.york.ac.uk/PROSPEROFILES/5d071fe325fb234761a852d5813198b7.pdf>.

Selection process

Studies will be screened independently by at least two people (or person/machine combination) with a process to resolve differences.

Other relevant information about searching and screening

Covidence systematic review software will be used in study selection.

Two researchers will independently perform abstract and full-text screening for inclusion and exclusion criteria. Researchers will be blinded to each other's' decisions. Disagreements between individual assessments will be resolved by consulting a third member of the review team.

A decision algorithm developed by Pollock et al. will be used for managing the overlapping studies across the systematic reviews.

DATA COLLECTION PROCESS

Data extraction from published articles and reports

Data will be extracted independently by at least two people (or person/machine combination) with a process to resolve differences.

Authors will be asked to provide any required data not available in published reports.

Study risk of bias or quality assessment

Risk of bias will be assessed using: *AMSTAR-2*

GRADE critical appraisal tools

Data will be assessed independently by at least two people (or person/machine combination) with a process to resolve differences.

Additional information will be sought from study investigators if required information is unclear or unavailable in the study publications/reports.

Reporting bias assessment

Risk of bias due to missing results will be assessed

Certainty assessment

GRADE (Grading of Recommendations Assessment, Development and Evaluation) four-level scale to rate the certainty of evidence: high, moderate, low, and very low.

- Adequacy of sample size and representativeness.
- Appropriateness of control/comparator.
- Validity and reliability of surrogate measurement methods.
- Appropriate control for confounders.
- Completeness of outcome data and addressing of missing data.
- Consistency and reproducibility of findings across studies.

OUTCOMES TO BE ANALYSED

Main outcomes

Cardiometabolic clinical outcomes:

- Cardiometabolic mortality

- Acute cardiovascular or cerebrovascular events (unstable angina, myocardial infarction, stroke)
- Atherosclerosis (intima media thickness, plaque)
- Arteriosclerosis (media sclerosis)
- Blood lipids (i.e., total cholesterol, triglyceride, HDL-cholesterol, LDL-cholesterol, etc.)
- Blood pressure (systolic, diastolic)
- Vascular function (any measure)
- Arterial stiffness (any measure)
- Cardiac function (echo EF, diastolic function)
- Cardiac rhythm (atrial or/and ventricular fibrillation)
- Body mass index, waist circumference, waist to hip ratio, waist to height ratio
- Insulin resistance, metabolic syndrome, pre-diabetes
- Type 2 diabetes, and complications
- Overweight, obesity
- Blood glucose, HbA1c, blood insulin, insulin resistance (HOMA)
- MAFLD
- Hepatic function (any measure , FibroScan)
- Systemic inflammation (i.e., CRP, IL6, TNF, etc.)
- Cardiometabolic index

Additional outcomes

None

PLANNED DATA SYNTHESIS

Strategy for data synthesis

Data will be compiled in a tabular format and described by outcome. Meta-analyses will not be conducted.

Data will be organized and analyzed based to the population health status (healthy, at risk, or diseased).

Sex, age, or ethnicity will also be considered, if applicable.

CURRENT REVIEW STAGE

Stage of the review at this submission

Review stage	Started	Completed
Pilot work	✓	
Formal searching/study identification	✓	
Screening search results against inclusion criteria	✓	
Data extraction or receipt of IPD		
Risk of bias/quality assessment		
Data synthesis		

Review status

The review is currently planned or ongoing.

Publication of review results

Results of the review will be published in English.

REVIEW AFFILIATION, FUNDING AND PEER REVIEW

Review team members

Emily Conrad. King's College London. England.

No conflict of interest declared.

Brendan Kesler. The Rowett Institute, University of Aberdeen, UK. United States of America.

Conflict of interest

Brendan J. Kesler is an employee of VDF Futureceuticals Inc.

Dr Abbie Cawood. Holland and Barrett. England.

Conflict of interest

Abbie Cawood is an employee of Holland and Barrett.

Dr Anthony Lynn. Sheffield Hallam University. England.

Conflict of interest

Anthony Lynn received a grant income from the US Cherry Marketing Institute.

Cariad Lucas. School of Sport and Health Sciences, Cardiff Metropolitan University. Wales.

No conflict of interest declared.

Associate Professor Christine Bosch. University of Leeds, UK. England.

No conflict of interest declared.

Professor Cristian Del Bo'. University of Milan, Italy. Italy.

No conflict of interest declared.

Associate Professor Daniel Perrone. Federal University of Rio de Janeiro. Brazil.

No conflict of interest declared.

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No conflict of interest declared.

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No conflict of interest declared.

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No conflict of interest declared.

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Conflict of interest

Jenna Burke is an employee of Holland and Barrett.

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No conflict of interest declared.

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No conflict of interest declared.

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Conflict of interest

Marion Mackonochie is an employee of Holland and Barrett.

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No conflict of interest declared.

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No conflict of interest declared.

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No conflict of interest declared.

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No conflict of interest declared.

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No conflict of interest declared.

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No conflict of interest declared.

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No conflict of interest declared.

Associate Professor Charlotte Mills. University of Reading, UK. England.

No conflict of interest declared.

Professor Ana Rodriguez-Mateos (review guarantor and contact) King's College London, UK. England.

No conflict of interest declared.

Named contact

Professor Ana Rodriguez-Mateos (ana.rodriguez-mateos@kcl.ac.uk). King's College London, UK. England.

Review affiliation

UK Nutrition Society Special Interest Group "Phytochemicals and Health"

Funding source

Review has no specific/external funding but is supported by guarantor/review team (non-commercial) institutions.

Peer review

There has been no peer review of this planned review.

ADDITIONAL INFORMATION

Review conflict of interest

Declared individual interests are recorded under team member details. Five review team members have declared a potential conflict of interest. This review also notes the following interests:

This work was undertaken under the "Phytochemicals and Health" Special Interest Group of the UK Nutrition Society

Ana Rodriguez-Mateos, Ciriad Lucas, Charlotte Mills, Christine Bosch, Cristian Del Bo', Daniel Perrone, Dragan Milenkovic, Emily Conrad, Imogen Tanner, Jakya Wynn, Liam Corr, Marianthi Firoglani-Moschi, Paul Kroon, Rebecca Colombage, Tatjana Ruskovska, Tatiana Diacova, Vanesa Krsteva, Xiaohe Liu, Yifan Xu declare no conflicts of interest.

Brendan J. Kesler is an employee of VDF Futureceuticals Inc.

Abbie Cawood, Jenna Burke and Marion Mackonochie are employees of Holland and Barrett.

Anthony Lynn previously received a grant income from the US Cherry Marketing Institute

Medical Subject Headings

Cardiovascular Diseases; Anthocyanins; Metabolic Diseases

SIMILAR REVIEWS

Check for similar records already in PROSPERO

PROSPERO identified a number of existing PROSPERO records that were similar to this one (last check made on 1 August 2025). These are shown below along with the reasons given by that the review team for the reviews being different and/or proceeding.

- Efficacy of Flavan-3-ols on Cardiometabolic Health: An Umbrella Review of Systematic Reviews and Meta-Analyses of Randomized Controlled Trials and Observational Studies. [published 25 July 2025] [CRD420251074385]. The review was judged **not to be similar**
- A Systematic Review of the Effects of Anthocyanin on Adiponectin in Obesity [published 31 May 2023] [CRD42023425413]. The review was judged **not to be similar**
- Effects of anthocyanins on oxidative stress of hemodialysis patients: a systematic review and meta-analysis of clinical trials [published 3 November 2020] [CRD42020209742]. The review was judged **not to be similar**

PROSPERO version history

- [Version 1.0, published 11 Jun 2026](#)

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Any enquiries about the record should be referred to the named review contact