nature portfolio

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Reporting Summary

Nature Portfolio wishes to improve the reproducibility of the work that we publish. This form provides structure for consistency and transparency in reporting. For further information on Nature Portfolio policies, see our Editorial Policies and the Editorial Policy Checklist.

Statistics

For all statistical analyses, confirm that the following items are present in the figure legend, table legend, main text, or Methods section.

n/a	Confirmed	
☐	☒	The exact sample size (*n*) for each experimental group/condition, given as a discrete number and unit of measurement
☐	☒	A statement on whether measurements were taken from distinct samples or whether the same sample was measured repeatedly
☐	☒	The statistical test(s) used AND whether they are one- or two-sided *Only common tests should be described solely by name; describe more complex techniques in the Methods section.*
☐	☒	A description of all covariates tested
☐	☒	A description of any assumptions or corrections, such as tests of normality and adjustment for multiple comparisons
☐	☒	A full description of the statistical parameters including central tendency (e.g. means) or other basic estimates (e.g. regression coefficient) AND variation (e.g. standard deviation) or associated estimates of uncertainty (e.g. confidence intervals)
☐	☒	For null hypothesis testing, the test statistic (e.g. *F*, *t*, *r*) with confidence intervals, effect sizes, degrees of freedom and *P* value noted *Give P values as exact values whenever suitable.*
☐	☒	For Bayesian analysis, information on the choice of priors and Markov chain Monte Carlo settings
☒	☐	For hierarchical and complex designs, identification of the appropriate level for tests and full reporting of outcomes
☐	☒	Estimates of effect sizes (e.g. Cohen's *d*, Pearson's *r*), indicating how they were calculated

Our web collection on statistics for biologists contains articles on many of the points above.

Software and code

Policy information about availability of computer code

Data collection	REDCap software (Version 9.1.0 Tennessee), Omron Healthcare (Japan, HEM-7121), Mobil-O-Graph BP device (IEM Industrielle Entwicklung Medizintechnik), SmartPill™ Motility Testing System (Medtronic)
Data analysis	FoodWorks Professional software (Version 7.01, Xyris, Queensland), GraphPad Prism version 9, SPSS software (version 25), MicrobiomeAnalyst (https://www.microbiomeanalyst.ca/MicrobiomeAnalyst/home.xhtml), microbiome pipeline available at https://github.com/michael-nakai/waterway

For manuscripts utilizing custom algorithms or software that are central to the research but not yet described in published literature, software must be made available to editors and reviewers. We strongly encourage code deposition in a community repository (e.g. GitHub). See the Nature Portfolio guidelines for submitting code & software for further information.

Data

Policy information about availability of data

All manuscripts must include a data availability statement. This statement should provide the following information, where applicable:

- Accession codes, unique identifiers, or web links for publicly available datasets
- A description of any restrictions on data availability
- For clinical datasets or third party data, please ensure that the statement adheres to our policy

16S rRNA sequence data has been made available on NCBI Sequence Read Archive: Submission number PRJNA903679

Human research participants

Policy information about studies involving human research participants and Sex and Gender in Research.

Reporting on sex and gender	Male and female participants were recruited. 30% of the participants (n=6) self-reported as female. Data was analysed for sex effects, however, none were observed. Thus, results presented are sex-independent.
Population characteristics	The mean age of the participants was 55 years and 70% self-reported as male. All were residing in Melbourne, Australia at the time of the trial. There were no excluded criteria related to ethnic background.
Recruitment	Participants were recruited between July 2019 and September 2021 through advertisement (print media, social media, email and GP) in Melbourne, Australia. Participants with food intolerances or specific dietary requirements (e.g. plant-based, gluten-free) were excluded from the study; thus, effectiveness in patients with specific dietary needs may be different from reported.
Ethics oversight	Human ethics approval was obtained from Monash University Human Research Ethics Committee (Study ID: 19203). The study was registered at the Australian New Zealand Clinical Trials Registry (ACTRN12619000916145) and followed the Declaration of Helsinki. All participants provided written informed consent before commencing the trial.

Note that full information on the approval of the study protocol must also be provided in the manuscript.

Field-specific reporting

Please select the one below that is the best fit for your research. If you are not sure, read the appropriate sections before making your selection.

☒ Life sciences ☐ Behavioural & social sciences ☐ Ecological, evolutionary & environmental sciences

For a reference copy of the document with all sections, see nature.com/documents/nr-reporting-summary-flat.pdf

Life sciences study design

All studies must disclose on these points even when the disclosure is negative.

Sample size	Power calculate was performed with an α=0.05 (calculated effect size 0.8) to determine a 7 mm Hg difference in 24-hour systolic BP. we estimated we would require 26 subjects to achieve 80% power, however, due to Covid-19 pandemic delays, 21 participants were recruited.
Data exclusions	No data was excluded
Replication	SCFAs and Proquantum immunoassays were performed in duplicates.
Randomization	We used a 1:1 randomisation using the program REDCap
Blinding	This study was double-blinded; concealment of the allocated diet was labelling all food and material related to the trial as 'Diet A' and 'Diet B'. The study coordinator was only unblinded after the trial was completed, when the analysis of the data was completed.

Reporting for specific materials, systems and methods

We require information from authors about some types of materials, experimental systems and methods used in many studies. Here, indicate whether each material, system or method listed is relevant to your study. If you are not sure if a list item applies to your research, read the appropriate section before selecting a response.

Materials & experimental systems

n/a	Involved in the study
☒	☐ Antibodies
☒	☐ Eukaryotic cell lines
☒	☐ Palaeontology and archaeology
☒	☐ Animals and other organisms
☐	☒ Clinical data
☒	☐ Dual use research of concern

Methods

n/a	Involved in the study
☒	☐ ChIP-seq
☒	☐ Flow cytometry
☒	☐ MRI-based neuroimaging

Clinical data

Policy information about clinical studies

All manuscripts should comply with the ICMJE guidelines for publication of clinical research and a completed CONSORT checklist must be included with all submissions.

Clinical trial registration	The study was registered at the Australian New Zealand Clinical Trials Registry (ACTRN12619000916145)
Study protocol	Study protocol was published and can be accessed at https://trialsjournal.biomedcentral.com/articles/10.1186/s13063-021-05468-2
Data collection	Data was collected between July 2019 and September 2021. Participants were recruited through printed advertisements on notice boards, social media, tabloid print media, or e-mailed directly from a database of participants who approved to be contacted for trial consideration. Untreated hypertensive participants were recruited and screened for eligibility before being randomised.
Outcomes	The primary outcome of this study was a decrease in 24-hour systolic BP measured using ABPM measurements. Secondary outcomes included changes in plasma SCFA levels, circulating markers of inflammation and faecal microbial composition.