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Effect of a polyphenol-rich diet on leaky gut in the elderly

Submission date
20/02/2017

Recruitment status
No longer recruiting

Registration date
28/04/2017

Overall study status
Completed

Last Edited
27/08/2024

Condition category
Digestive System

[_] Prospectively registered
[X] Protocol
[_] Statistical analysis plan
[X] Results
[_] Individual participant data

Plain English summary of protocol

Background and study aims
Intestinal permeability is a term describing the control of material passing from inside the gut, through the gut wall to the rest of the body. Leaky gut syndrome is a condition that occurs when the gut lining becomes abnormally permeable, when tiny openings develop in the gut wall. This allows substances to pass through the gut wall that would normally be blocked. The microorganisms that naturally live in the gut (intestinal microbiota) are an important regulator of gut permeability. Diet is an important factor that shapes the composition of the intestinal microbiota. Polyphenols are important nutrients derived from plant-based foods that have been shown to improve health. The aim of this study is to find out what effect eating a diet rich in polyphenols has on health and intestinal permeability in the elderly.

Who can participate?
Adults aged 60 and over who have a leaky gut.

What does the study involve?
Participants are randomly allocated to one of two groups, which consume two study diets in a random order for eight weeks, with an eight week period of consuming their usual diet in between. The first diet involves eating three potions of polyphenol-rich foods every day, such as berries and derived products, blood oranges and derived products, pomegranate juice, renetta apple and purée, green tea and dark chocolate products. The second diet involves eating a similar diet without the addition of the polyphenol-rich foods. Before and after each eight week diet, participants have blood, urine and stool samples collected in order to evaluate the impact of the diet of their health and intestinal permeability.

What are the possible benefits and risks of participating?
Consuming more polyphenol rich products may help to reduce intestinal permeability and therefore improve intestinal function. There are no notable risks involved with participating.

Where is the study run from?
1. Ministry of Agricultural, Food and Forestry Policies (Italy)
2. Biotechnology and Biological Sciences Research Council (UK)
3. Ministry of Economy, Industry and Competitiveness (Spain)

When is the study starting and how long is it expected to run for?
May 2016 to December 2019 (updated 05/03/2020, previously: March 2019)

Who is funding the study?
Fondazione Opera Immacolata Concezione (OIC foundation) (Italy)

Who is the main contact?
Professor Patrizia Riso
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Contact information

Type(s)
Scientific

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Additional identifiers

Protocol serial number
N/A

Study information

Scientific Title
Gut and blood microbiomics for studying the effect of a polyphenol-rich dietary pattern on intestinal permeability in the elderly

Acronym
MaPLE

Study objectives

A polyphenols rich diet can reduce Intestinal Permeability (IP) in a way that is beneficial for the Intestinal Barrier (IB), resulting in reduced IP and decreased translocation of inflammogenic bacterial factors from the digestive tract into the bloodstream and an improvement of intestinal microbial ecosystem (IME).

Ethics approval required
Old ethics approval format

Ethics approval(s)
Ethics Committee of the University of Milan, 15/02/2016, ref: 6/16 CE_15.02.16_Verbale_All-7

Study design
Randomised controlled cross over study

Primary study design
Interventional

Study type(s)
Prevention

Health condition(s) or problem(s) studied
Intestinal permeability (IP)

Interventions
Based on a computer randomization plan, subjects are randomized to receive the two study diets in a random order. Participants follow the diets for eight weeks, followed by an eight week washout period where they follow their regular diet and then the other diet for eight weeks.

Polyphenol-rich (PR)-diet: Participants consume a diet developed to double the amount of polyphenols intake (as recorded in the population under study) providing three portion of polyphenol-rich food products daily (i.e about 750 mg of total polyphenols are added to the amount regularly introduced). The following polyphenol-rich products have been considered in the PR-diet: berries and derived products, blood oranges and derived products, pomegranate juice, renetta apple and purée, green tea and dark chocolate products.

The control diet (C-diet): Participants consume a comparable diet for eight weeks without thepolyphenol-rich products.

Before and after each study diet period (at baseline, 8, 16 and 24 weeks), participants provide blood, urine and stool samples.

Intervention Type
Other

Primary outcome(s)
Intestinal permeability is evaluated by measuring Zonulin serum levels using an ELISA kit at baseline, 8, 16 and 24 weeks.

Key secondary outcome(s))

1. Fecal microbiota composition evaluated by 16S rRNA gene profiling with MiSeq-Illumina platform at baseline, 8, 16 and 24 weeks
2. Short chain fatty acids and polyphenol-derived metabolites measured with LC-MS system at baseline, 8, 16 and 24 weeks
3. Diet-induced changes in microbiota metabolism performed by NMR at baseline, 8, 16 and 24 weeks
4. LC-MS analysis are used for faecal water at baseline, 8, 16 and 24 weeks
5. Total blood bacterial load are assessed through a quantitative real-time PCR; taxomic profile investigated by 16S rRNA gene profiling with MiSeq-Illumina platform at baseline, 8, 16 and 24 weeks
6. Inflammatory markers, oxidative stress and related markers e.g. vascular cell adhesion molecule (VCAM)-1 and intracellular adhesion molecule (ICAM)-1 performed through ELISA kit at baseline, 8, 16 and 24 weeks
7. DNA damage assessed through Comet Assay at baseline, 8, 16 and 24 weeks
8. Endotoxin by Limulus Amebocyte Lysate (LAL) assay assessed to evaluate the inflammatory process and oxidative stress modulation at baseline, 8, 16 and 24 weeks
9. Metabolomic analysis will be performed on HPLC-ESI-Q-ToF-MS and NMR to understand the interaction of the polyphenol rich diet with the secondary metabolites of microbiota at baseline, 8, 16 and 24 weeks

Completion date
31/12/2019

Eligibility

Key inclusion criteria
1. Age > 60 years old
2. Intestinal Permeability evaluated by Zonulin serum level
3. Adequate nutritional status evaluated with Mini Nutritional Assessment (MNA) score ≥24
4. Good cognitive status tested with Mini Mental State Evaluation (MMSE) score ≥24
5. Self-sufficiency assessed with validated tests (e.g. Barthel index - activities of daily living, Tinetti balance assessment)

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Senior

Sex
All

Total final enrolment
66

Key exclusion criteria

1. Celiac disease
2. Severe liver disease with cirrhosis
3. Severe renal insufficiency (dialysis)
4. Presence of Chronic Obstructive Pulmonary severe COPD (oxygen therapy for many hours a day) or severe heart failure, i.e. class III or IV NYHA - New York Heart Association
5. Antibiotic treatment
6. Malignant tumor that required treatment in the previous 2 years

Date of first enrolment
01/06/2016

Date of final enrolment
01/06/2017

Locations

Countries of recruitment
Italy

Study participating centre
Fondazione Opera Immacolata Concezione (OIC foundation)
Via Toblino, 53
Padua
Italy
35142

Sponsor information

Organisation
European Joint Programming Initiative “A Healthy Diet for a Healthy Life” (JPI - HDHL)

Funder(s)

Funder type
Government

Funder Name
Ministero delle Politiche Agricole Alimentari e Forestali

Alternative Name(s)
Ministero delle Politiche Agricole, Alimentari e Forestali, Ministry of Agricultural, Food and Forestry Policies, MiPAAF

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
Italy

Funder Name
Biotechnology and Biological Sciences Research Council

Alternative Name(s)
UKRI - Biotechnology And Biological Sciences Research Council, BBSRC UK, Biotechnology and Biological Sciences Research Council (BBSRC), BBSRC

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location
United Kingdom

Funder Name
PCIN-2015-238 Ministry of Economy, Industry and Competitiveness, Spanish government

Results and Publications

Individual participant data (IPD) sharing plan
The current data sharing plans for the study are unknown and will be made available at a later date.

IPD sharing plan summary
Data sharing statement to be made available at a later date

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Results article	results	18/12/2020	04/01/2021	Yes	No
Results article		09/09/2021	21/09/2021	Yes	No
Results article		02/11/2021	03/11/2021	Yes	No
Results article		22/03/2022	23/03/2022	Yes	No

Results article	protocol	24/08/2024	27/08/2024	Yes	No
Protocol article		26/02/2020	28/02/2020	Yes	No
Interim results article		15/08/2020	06/06/2023	Yes	No
Participant information sheet	Participant information sheet	11/11/2025	11/11/2025	No	Yes