The EXPLAIN Study: Exploring plant-based meat analogues for their Impact on health

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Ethical review	Approved WMO
Status	Recruiting
Health condition type	Other condition
Study type	Interventional

Summary

ID

NL-OMON56473

Source
ToetsingOnline

Brief title
EXPLAIN

Condition

- Other condition

Synonym
Cardiovascular and metabolic health, healthy bowel, heart disease, intestinal health

Health condition

Veranderingen in cardiometabole gezondheid en darmgezondheid

Research involving
Human

Sponsors and support

Primary sponsor: Wageningen Universiteit
Source(s) of monetary or material Support: EvergrainInternational B.V.,NutriS d.o.o.,Roquette,Topsector voor Kennis en Innovatie (TKI),Unilever,V2Foods

Intervention

Keyword: Cardiometabolic health, Intestinal health, Plant based meat analogues, Standardized diet

Outcome measures

Primary outcome

The main study parameter is the systolic blood pressure as measured with

in-clinic blood pressure measurements after 8 weeks of intervention with PBMAs

(corrected for baseline value) compared to 8 weeks of intervention with meat.

Secondary outcome

As secondary objectives, we examine of the effect replacing all meat products

in an average Dutch diet with currently commercially available PBMAs in a

2x8week crossover study on 1) cardiometabolic health, 2) gastro-intestinal

microbiome and intestinal health, 3) well-being and 4) underlying biological

mechanisms related to health. The specific outcomes related in the listing

below.

In addition, we aim to study the relation between diet specific responses

(comparing PBMAs and meat products) and phenotype, including glucose responses

and body composition.

- Diastolic blood pressure as measured in-clinic

- Diastolic & systolic blood pressure and heart rate as measured at-home

- Blood glucose levels

- Blood lipid spectrum

-Fasting blood nutritional status including vitamin/mineral status

- Blood immune and immune metabolism markers and immune cell populations

- Circulating metabolites before and after a high fat mixed meal (HFMM) under

fasting and postprandial (HFMM) conditions

- Faecal microbiota composition

- Oral microbiota composition

- Microbial metabolites

- Microbiome functionality

- Gastro-intestinal symptoms

- Gastro-intestinal transit time

- Product-specific attitude towards and meal-specific satiety with meat and

PBMAs;

- General attitude towards meat and PBMAs.

- Metabolomics in blood and 24-hour urine

- Blood transcriptomics and proteomics

Study description

Background summary

Plant-based diets with little to no meat are considered healthy and sustainable by the general public. The increasingly popular plant-based meat analogues (PBMAs) allow consumers to easily decrease meat intake while maintaining their dietary pattern. PBMAs are designed to mimic the sensory and textural properties of meat and to replace animal protein with plant protein. Processing of plant-based ingredients is needed to achieve this, which potentially

compromises sustainability and health assets of PBMAs. One of the concerns with processing is that it results in relatively high salt levels in the products, which could affect the blood pressure of consumers. However, scientific knowledge on the health impact of PBMAs on humans is currently very limited. Therefore, a fully controlled dietary intervention with a standardized diet is needed to evaluate the health impact of commercially available PBMAs.

Study objective

The primary objective is to evaluate if and to what extend replacing all meat products in an average Dutch diet with currently commercially available PBMAs affects the systolic blood pressure of middle aged men and women in a 2x8 week fully dietary controlled crossover intervention study. The secondary objectives are to assess the effect of this replacement of meat products with PBMAs on cardiometabolic health, gut microbiome and intestinal health, well being and underlying biological mechanisms.

Study design

The study compromises a randomized crossover fully controlled dietary intervention at Wageningen University which compromises of 2x8 week interventions separated by a 10 week washout period. Before the intervention starts, a characterization of the participants will be performed in order to describe them on anthropometrics, glucose tolerance and insulin sensitivity, genetics, sleep patterns and stress levels. Prior to the start and at the end of each 8-week dietary intervention period, several measurements, including systolic blood pressure monitoring and secondary outcome measures will be done. Additionally, throughout the dietary interventions systolic and diastolic blood pressure will be monitored and a small quantity of parameters related to the secondary objectives will measured.

Intervention

Participants will follow both a 8-week completely controlled diet in which all meats are of plant-based origin (PBMAs) and a 8-week diet in which all meats are of animal origin in randomized order with a 10-week wash-out period. Diets are fully controlled which implies that all foods and meals are provided to participants by the Human Nutrition Research Unit (HNRU) and are based on participants habitual energy needs to maintain a stable body weight throughout the study. Except for PBMAs/meat, all other foods will be identical in both intervention diets. The composition of the diets is based on the Dutch National Food Consumption Survey. All food products provided, including the PBMAs, are commercially available.

Study burden and risks

The total study duration for a participant will be a little >6 months, including the 10 week washout. The total time that needs to be invested by participants in this study with visits and at-home measurements is 72 hours. Participants are restricted for a total of 16 weeks in their eating habits, since they need to follow a fully standardized diet. Subjects will have their blood pressure measured at the HNRU and additionally will have to measure their own blood pressure at home. In addition, subjects have to wear continuous glucose and physical activity monitors twice during the study for a total of approximately 28 days. During the characterization period, participants will visit the HNRU once or twice depending on participant preference. For the measurements prior to- and at the end of each dietary intervention period, participants visit the HNRU three times per intervention period (one extra visit after for the HFMM), so six times total. Additionally, during the dietary intervention, participants will visit the Human Research Unit twice a week during dinner time.

The following burdens or risks may be associated with participation:

- The in-clinic and at-home blood pressure measurements are non-invasive. However, the inflation of the arm cuff could potentially cause very mild discomfort, but only for a very short amount of time (±20 seconds).
- Participants have to wear a continuous glucose monitor (CGM) twice. The placement of the CGM, though minimally invasive, could be considered a burden for the participants. We minimize this burden by using a continuous glucose monitor that does not need regular calibration by finger pricks, and by using it for only 2x ~14 days, instead of the full 16 weeks. The placement of the Freestyle Libre will be done by experienced researchers.
- While wearing the CGM, participants will also wear an activity monitor; an accelerometer. The ActiGraph placement is also not invasive, and has an adjustable band to make wearing it as comfortable as possible.
- During test days, blood will be collected by venepuncture, which can occasionally result in a local hematoma or bruise. Some participants report pain during venepuncture. The blood collection will be done by experienced nurses. A total of ~516 mL of blood will be drawn over the entire RCT (> 6 month period). For conventional blood donations, men donate ~500 mL blood every 2.5 months and women every 4 months.
- The collection of faecal and urine samples can be experienced as a burden (collecting the samples and storing them at home). However, based on previous experience, this procedure is quite feasible.
- In the DEXA scan, we use X-rays. In this examination, participants will receive a total of about 0.002 mSv of radiation. In comparison, the "normal" radiation that everyone in the Netherlands receives anyway is about ~2.5 mSv per year. The radiation from the DEXA scan could cause damage to participants health, but this risk is small. There is no harm if you have to undergo an examination or treatment with radiation for a medical reason. If participants have more frequent examinations with radiations, the doctor will check if it is wise to undergo the DEXA scan and participants will be excluded from the scan

(but not the intervention) if determined so by the medical doctor.
- The blue coloured cakes are made from commercially available ingredients, including a food-grade blue dye. No discomfort is to be expected from consuming them, only small temporary staining of the tongue, which will not last >1 hour.

All food products in the intervention are commercially available. We do not expect that either the composition of the diets or individual food products will cause discomfort for the participants. Concerning the OGTT in the characterization and the and HFMM in the intervention, there are no known risks. These measurements are routinely applied in human biology research and SOPS are available in the database of the Human Nutrition Department.

The study population exactly fits the population of interest, since middle-aged and overweight/obese individuals are at risk of developing high blood pressure and other cardiometabolic diseases. Additionally, we do not expect to find effects in young people. A study evaluating the health impact of PBMAs contributes to a better understanding of how these products fit into a healthy diet and may be important in the current protein transition.

Contacts

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Trial sites

Listed location countries

Netherlands

Eligibility criteria

Age
Adults (18-64 years)
Elderly (65 years and older)

Inclusion criteria

- BMI of 23-40 kg/m2;
- Age 45-75 years;
- Willing to consume both meat and PBMAs;
- Stable body weight (lost/gained ±<3 kg over the last 3 months prior to inclusion).

Exclusion criteria

- Diseases or prior surgeries affecting the stomach, liver, kidneys or intestines (allowed i.e. appendectomy);
- Food allergies, intolerances (including lactose/gluten intolerance) for products used in the study design and/or dietary restrictions interfering with the study (including special diets, vegetarians and eating disorders);
- Cardiovascular diseases (e.g. heart failure. But hypertension up to 160 mmHg is allowed for inclusion as indicated by the research physician) or cancer (e.g. non-invasive skin cancer allowed);
- Anaemia defined as Hb concentrations <8.5 mmol/L for men and <7.5 mmol/L for women;
- Diagnosed with type 1 or type 2 diabetes;
- Blood pressure >160 mmHg*;
- Major mental disorders;
- Drug treated thyroid diseases (well substituted hypothyroidism is allowed for inclusion);
- Diseases with a life expectation shorter than 5 years.
- Regular use of/receiving medication interfering with research outcomes (as judged by research physician), such as use of glucose lowering drugs, insulin, use of medication that impacts gastric emptying, use of antipsychotics;
- Starting or changing blood pressure medication type or dose during the study. (Continuation of blood pressure medication usage is allowed during study);
- Use of anti-biotics over the last 3 months before study start.
- Dietary habits interfering with study design (vegan/vegetarian, ketogenic diet etc.);
- Intention to change the intensity of exercise during the study period;
- Intention to lose weight during the study period;
- Current smokers (including use of e-cigarettes);
- Use of soft and/or hard drugs (cannabis included);

- Abuse of alcohol (alcohol consumption defined as >14 glasses (women) or >21 glasses (men) of alcoholic beverages per week);
- Use of strong vitamins or other dietary supplements (e.g. iron- or B12-supplements, pre- or probiotics) expected to interfere with the study outcomes.
- Donated blood within 2 months prior to the screening;
- Inability to comply with the study diet;
- Being pregnant or lactating or planning to become pregnant;
- Unable/unwilling to download a research application on the mobile phone;
- Inability to understand study information and/or communicate with staff;
- Inability/unwillingness to comply to staff instructions;
- Displaying misbehaviour towards other participants/staff;
- Participation in another study that involves an intervention within two months prior to the intervention;
- Working or doing a thesis/internship at the division of Human Nutrition and Health or the Laboratory of Microbiology of Wageningen University.

*Participants with a screening systolic blood pressure >145 mmHg - <=160 mmHg need written permission for participation without having (medical) treatment for the study period granted by their general practitioner after assessment of their cardiovascular risk. Participants within this screening range that cannot handover written clearance of their general practitioner will be excluded from participation. Participants whose blood pressure has measured >140 mmHg (systolic) or >90 mmHg (diastolic) one or more times during the study, will receive a letter for referral to the general practitioner.

Study design

Design

Study type:	Interventional
Intervention model:	Crossover
Allocation:	Randomized controlled trial
Masking:	Single blinded (masking used)
Control:	Active
Primary purpose:	Other

Recruitment

NL

Recruitment status:	Recruiting
Start date (anticipated):	05-02-2024
Enrollment:	114
Type:	Actual

Ethics review

Approved WMO Date:	09-01-2024
Application type:	First submission
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)
Approved WMO Date:	25-04-2024
Application type:	Amendment
Review commission:	CMO regio Arnhem-Nijmegen (Nijmegen)

Study registrations

Followed up by the following (possibly more current) registration

No registrations found.

Other (possibly less up-to-date) registrations in this register

No registrations found.

In other registers

Register	ID
CCMO	NL84824.091.23