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ChangeEat! – Household dinners with alternative proteins to reduce red and processed meat consumption in young adult couples

Submission date
26/04/2023

Recruitment status
No longer recruiting

Registration date
27/04/2023

Overall study status
Completed

Last Edited
21/07/2025

Condition category
Other

[ ] Prospectively registered
[ ] Protocol
[ ] Statistical analysis plan
[ ] Results
[ ] Individual participant data
[ ] Record updated in last year

Plain English summary of protocol

Background and study aims
Europeans eat twice as much meat as the world average, with the European Commission being called upon to reduce EU27 meat consumption in 71% by 2030 to meet global sustainable development goals. Portugal is a case in point. According to the 2020 National Food Balance Sheet, 21% of the average daily energy intake in this country derives from the consumption of meat, which is over four times more than what is recommended by dietary guidelines. In particular, and according to National Food Consumption Survey data collected in 2015-2016 for the resident population, adults (18-65 years old) eat, on average, close to 100 grams of red and processed meats daily. This far exceeds the value recommended for a balanced diet – 28 grams per day –, and even more so the value recommended by the United Nations for a healthy diet from sustainable food systems – 14 grams per day. Extant scientific evidence suggests that the creation of opportunities for young adults to experience - free of charge and fully integrated in their daily lives and family routines -, a diversified offer of innovative food products, which configure safe, healthy, nutritious, tasty and easy to prepare alternatives to meat, is one of the most effective means of reducing red and processed meat consumption in the long run. ChangeEat! is a study testing whether young adults (18-40 years old) living in Portugal can reduce their daily red and processed meat intake when provided with alternative, meat-free protein sources to cook and eat together with their spouse/romantic partner for dinner at home thrice a week during six weeks, to the extent that 20% of their daily protein intake from red and processed meats is replaced. This is the first intervention of its kind to assess the impact of replacing meat by edible insect and plant based products in daily meals as mechanism of behavioural change seeking to reduce meat consumption at population level, aided by the leveraging of social influences and the formation of new food consumption habits and identities. Its results will contribute to the promotion of healthier and more sustainable diets among adults worldwide.

Who can participate?
All young couples (up to 40 years of age), regardless of sex or marital status. Couples must live

together, without other adults or children, be healthy, have no food or dust-mite allergies, eat red and processed meats and demonstrate availability to collect, prepare and consume edible insect and plant based foods as alternative sources of protein at dinner meals throughout the study.

What does the study involve?
The study is disseminated through several media within sponsor organizations and their communities, as well at regional and national level through press releases, news and radio interviews. Prospect couples reaching its website https://www.cbqf.esb.ucp.pt/en/ChangeEat or contacting the study team at changeeat@ucp.pt or info@sensetest.pt are asked to check their eligibility by filling in anonymous online questionnaires prior to enrolling in a study information session at one of the trial centres. Once couple members' eligibility is verified and they provide informed consent, they are enrolled and requested to carry out some initial study activities (week 0) that include filling in an online questionnaire, attending a food tasting session and completing a 4-day food diary. Subsequently, they are randomly allocated to one of three groups. Couples in the first/second group collect provisions of seven edible insect/plant based foods from trial centres, which they will have to adequately store, prepare, eat and assess at home thrice a week throughout six weeks (weeks 1-6), following a given weekly dinner menu plan. They attend a food tasting session and complete another 4-day food diary at the end of their at-home activities (week 6) as well as two weeks after (week 8). They finish their participation by filling in an online questionnaire 13 weeks after starting the study. Couples in the third group attend a food tasting session and complete another 4-day food diary seven weeks after starting the study (week 6), after which they collect their provisions of seven edible insect/plant based foods from trial centres. Like the other groups, they will have to adequately store, prepare, eat and assess these foods at home thrice a week throughout six weeks (weeks 7-12), following a given weekly dinner menu plan. They complete their participation by attending a food tasting session at the end of their at-home activities (week 12) and filling in an online questionnaire 17 weeks after starting the study.

What are the possible benefits and risks of participating?
Couples are financial compensated for partaking in study sessions and collecting provisions at trial centres. Study results will contribute to promote healthy and sustainable diets among European adults more effectively.
The production of insect-based intervention foods uses exclusively whole (not live) or ground (e. g., flour) insects from the species Acheta domesticus (house cricket), Tenebrio mollitor (yellow mealworm - larvae) and Alphitobius diaperinus (buffalo worm - larvae). Within the scope of article 35 (transitional measures) of the EU Novel Food Regulation 2015/2283, the Portuguese General Directorate of Food and Veterinary Medicine (DGAV) has approved the production, trading and use of these insect species and forms for human consumption. Scientific evidence supports that farmed edible insects are generally safe for human consumption when produced and handled according to general food standards. The only risk so far associated to edible insect foods is a mild allergic reaction upon exposure, namely in persons with allergies to crustaceans and dust mites. Persons identified with, or suspected of having such allergies are excluded from participation.
Some insect and all plant based intervention foods are commercially available in Europe. Standard food safety and handling/preparation practices are applied to the production and testing of intervention foods by qualified staff and overseen by technical and scientific experts. Participants are fully informed about intervention food characteristics (composition, nutritional value, sensory profile, shelf-life, preparation) and adequate use practices at study start; dedicated research team members are readily available to provide further support throughout the study.

Where is the study run from?
ChangeEat! is run by Universidade Católica Portuguesa, Universidade do Porto and Sense Test, Sociedade de Estudos de Análise Sensorial a Produtos Alimentares, Lda.

When is the study starting and how long is it expected to run for?
January 2022 to April 2023

Who is funding the study?
European Union's Horizon 2020 Research and Innovation Programme (Grant Agreement nr. 861976, Project SUSINCHAIN).

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Study information

Scientific Title
A randomised waitlist-controlled trial of ChangeEat! – A behavioural intervention to reduce red and processed meat consumption in young adult couples by providing edible insect or plant based foods for their household dinners

Acronym
ChangeEat!

Study objectives
Europeans eat twice as much meat as the world average, with the European Commission being called upon to reduce EU27 meat consumption in 71% by 2030 to meet global sustainable development goals. A case in point is Portugal, where the per capita meat supplies available for human consumption reached 230.0 g/day (84.0 kg/year) in 2020 (Food Balance Sheet 2016-2020). Meat contributed an estimated 21.0% (429.0 kcal) to mean daily energy intake, i.e., over a fourfold excess relatively to national dietary recommendations. According to the last National Food Consumption Survey (IAN-AF 2015-2016), adults (18-65 years) in Portugal consume an average of 129.0 g/day of meat. Three-quarters (97.0 g/day) correspond to intakes of red and processed meats, with 26.0% of women and 47.0% men consuming over 100 g of such foods daily. Meeting current guidelines for healthy and sustainable diets in Portugal requires thus a substantial reduction in daily adult meat consumption, particularly of red and processed meats.

This study tests whether:
1. Members of young adult couples (18-40 years old) living in Portugal can reduce their daily red and processed meat intake when provided with alternative, meat-free protein sources to cook and eat together for dinner at home thrice a week during six weeks, to the extent that 20,0% of their Daily Protein Intake from Red and Processed Meats (DPIRPM) is replaced.
2. Reduction is achieved without changes in total daily protein intake or weight status.
3. Reduction is maintained once provision ends.
4. Reduction is independent of the alternative provided - edible insect or plant based products.
5. Reduction is mediated by exposure to alternatives and changes in attitudes towards them, and concomitantly towards meat consumption.
6. Reduction is moderated by individual traits (demographic, socioeconomic and psychological).

Ethics approval required
Old ethics approval format

Ethics approval(s)
Approved 10/10/2022, Comissão de Ética em Tecnologias, Ciências Sociais e Humanidades (CETCH, the Ethics Committee for Technology, Social Sciences and Humanities of UCP, Palma de Cima, 1649-023 Lisboa – Portugal; +351 214 269 795; cetch.gii@ucp.pt), ref: CETCH2022-18

Primary study design
Interventional

Study design
Randomized wait-list controlled trial

Study type(s)
Prevention

Health condition(s) or problem(s) studied
Red and processed meat consumption of young adults in Portugal largely exceeds guidelines for healthy and sustainable diets, therefore this intervention seeks to replace up to 20,0% of their DPIRPM with protein from meat-free alternative sources.

Interventions
DESIGN
All eligible couples consenting to participate and completing baseline measurements are randomly assigned to two parallel treatment groups (edible insect or plant based foods) or a wait-list control group with a 1:1:1 allocation as per a computer-generated randomisation plan stratified by trial centre using 21 permuted blocks of six couples. That is, study participants are allocated to one of three groups:
1. Treatment with edible insect meat alternative
2. Treatment with plant based meat alternative
3. Wait-list control

TIMELINE AND ACTIVITIES
Couples allocated to the first/second group collect provisions of six edible insect/plant based foods from trial centres, which they will have to adequately store, prepare, eat and assess at home thrice a week throughout six weeks (weeks 1-6), following a given weekly dinner menu plan. They attend a food tasting session and complete a 4-day food diary at the end of their at-home activities (week 6) as well as two weeks after (week 8). They finish their participation by

filling in an online questionnaire 13 weeks after starting the study. Couples allocated to the wait-list control attend a food tasting session and complete a 4-day food diary seven weeks after starting the study (week 6), only after which they collect their provisions of six edible insect /plant based foods from trial centres. Like in the other groups, they will then have to adequately store, prepare, eat and assess these foods at home thrice a week throughout six weeks (weeks 7-12), following a given weekly dinner menu plan. They complete their participation by attending a food tasting session at the end of their at-home activities (week 12) and filling in an online questionnaire 17 weeks after starting the study.

COMPONENTS, DOSES AND MODES OF DELIVERY

It is assumed that the major source of DPIRPM among the study population are red and processed meats eaten as main dish at lunch and dinner, with the latter being the meal most regularly prepared and eaten together at home. Provisions of each intervention food are therefore portioned per homemade dinner for two adults, to accommodate household commensality, facilitate participant retention and adherence to treatment, and leverage positive social influences on the adoption of new products. The primary intervention aim of replacing 20,0% of DPIRPM with proteins from meat-free alternatives is therefore to be achieved by the substitution of red or processed meats with one of the intervention foods as the major source of protein in the main dish of three household dinners per study week, i.e., in the main dish of three out of 14 (21.4%) possible household main meals (lunch and dinner) consumed weekly. To ensure sufficient dietary variety, thereby enhancing intervention adherence, six different foods with an average protein content of 11,0-12,0% are provided to couples in Groups 1-2. Each food is portioned and packed in an amount suitable for consumption by two adults in one household dinner over the course of two or three weeks. Additional portions may be provided in case of spillage or loss.

It is further hypothesized that the achievement of study aims requires couples to receive each intervention food in sufficient amounts and with sufficient periodicity to be consumed by each individual participant three times over the course of the trial, as normal meal components, in normal quantities and at normal intervals, relatively to the consumption of red or processed meats at dinner. The duration of the intervention is thus set to six weeks and the dose to 18 test dinners per treatment group. The schedules of intervention dinners are pre-defined by a weekly menu planner that randomizes the order of intervention food exposure within and between couples in each treatment group and matches it across treatment groups. A household food provisioning schedule, entailing the collection of intervention food portions sufficient for two /three weeks (i.e., for six/nine dinners for two adults, each using one intervention food) three /two times at a study trial centre is agreed with couples. Weekly dinner plans, digital booklets with detailed product information and suggestions of recipes for 2-person meals and cooking ingredients are furthermore supplied to facilitate the integration of intervention foods in household dinners. Portion sizes, food provision schedules, weekly dinner plans and recipes are customized for each treatment, being all designed to minimize the likelihood of achieving the targeted meat protein replacement through an increase of total daily protein intake during treatment, namely due to intervention-attributable increases in the intakes of other sources of dietary protein (e.g., poultry, fish, eggs, cereals, pulses). Moreover, motivational and performance feedback messages, customized to each treatment, are sent every week to couples via digital media according to a pre-defined schedule. The same components, doses and mode of delivery apply to couples in the wait-list control group once they start intervention activities at home.

ADHERENCE

An information brief on the health and environmental benefits of replacing red and processed meats with alternative sources of protein in diet is supplied to prospect couples at the study information session. Participating couples have the opportunity to try, assess and ask questions

about all intervention foods at baseline tasting sessions held at trial centres. They receive print-outs and digital versions of their household food provisioning schedules and weekly dinner plans as guidance. These include treatment food descriptions and suggestions of simple, popular recipes that fit each food, its portion sizes and the overall aims of the intervention; some of their basic cooking ingredients are supplied together with intervention foods. They may choose the days of the week in which an intervention food is prepared and eaten for dinner at their household, as long as they do not alter the order of consumption defined by their weekly plan. Having an intervention food for dinner every other day Monday to Saturday is suggested.

Intervention Type
Behavioural

Primary outcome(s)
Daily Protein Intake from Red and Processed Meats (DPIRPM, g) as well as its proportion to Daily Protein Intake (DPI, g), DPI from meat (DPIM, g) and from Meat-Free Alternatives (DPIMFA, g) are measured through self-reported four-day food diaries and food frequency questionnaires at baseline (T0 = Week 0) and end-line (T1 = Week 6) in all study groups, and at one follow-up (T2 = Week 8) in treatment groups only.

Key secondary outcome(s)
1. Counts of lunches and dinners with Red and Processed Meats and Meat-Free Alternatives as major source of protein per week are measured through self-reported four-day food diaries and food frequency questionnaires at baseline (T0 = Week 0) and end-line (T1 = Week 6), in all study groups, and at one follow-up (T2 = Week 8), in treatment groups only.
2. Counts of dinners with Red and Processed Meats and Meat-Free Alternatives as major source of protein per week are measured through daily self-reporting during intervention weeks (Weeks 1-6) and a food frequency questionnaire administered at a second follow-up (T3 = Week 12), in all study groups.
3. BMI (≥ 20 years old, kg/m²) is measured at baseline (T0), end-line (T1 = Week 6) and one follow-up (T2 = Week 8) by a trained dietitian using the same calibrated beam balance scale and stadiometer set, in all study groups.
4. Acceptability and intention to eat intervention foods are measured under Central Location Test (CLT) at baseline (T0), end-line (T1 = Week 6) and one follow-up (T2 = Week 8) using self-administered 9-point hedonic and 11-point probability scales, respectively, in all study groups.
5. Acceptability of intervention foods and corresponding meal satiety are measured under Home Use Test (HUT) conditions per every consumption occasion during intervention weeks (Weeks 1-6) using self-administered 9-point hedonic (overall liking) and culturally-adapted Berkeley Hunger-Satiety scales, respectively, in all study groups.
6. Attachment to meat consumption is measured at baseline (T0), end-line (T1 = Week 6) and one follow-up (T2 = Week 8) using a self-administered Meat Attachment Questionnaire with items rated on a 7-point Likert scale, in all study groups.
7. Levels of disgust towards edible insects and insect-based foods are measured at baseline (T0), end-line (T1 = Week 6) and one follow-up (T2 = Week 8) using a self-administered, 11-point pictorial emoji scale, in all study groups.

Completion date
15/04/2023

Eligibility

Key inclusion criteria

DEMOGRAPHICS
1. Age: 18-40 years.
2. Household composition: Two adults, no children ≥ 3 years or that share adult meals. The other adult is a spouse or romantic partner eligible for participation.
DIET
3. Food habits: Eat meat regularly and share same homecooked household dinner with spouse /partner at least three times a week (self-reported).
ADHERENCE: ABILITIES & RESOURCES
4. Independent Portuguese speakers.
5. Independent internet users.
6. Own a device compatible with the requirements of outcome assessment.
7. Have sufficient time, skills and resources to adhere to study protocol, namely to complete outcome assessments and provision pick-ups as scheduled, to safely store foods and prepare daily meals at home, and to follow a weekly dinner menu planner.
ADHERENCE: COMMITMENT
8. Willing to consume edible insect and plant based foods as alternative sources of protein throughout the study (self-reported).
9. Not participating or planning to participate in another trial during the study period (self-reported).
10. No planned absences from home (≥ three consecutive days) during the study period (self-reported)
11. Provided informed consent to participate.

Participant type(s)
Healthy volunteer

Healthy volunteers allowed
No

Age group
Adult

Lower age limit
18 Years

Upper age limit
40 Years

Sex
All

Total final enrolment
252

Key exclusion criteria
HEALTH & NUTRITION STATUS
1. Diagnosed with physical or mental illness, or eating disorder (self-reported)
2. Undergoing or foreseeing to undergo medical treatment, including prescribed medication, during study (self-reported).
3. Pregnant or planning to conceive during study (self-reported).
4. Diagnosed with food or dust-mite allergies (self-reported)

5. Following or planning to follow a prescribed diet restricting the intake of energy, calorie-rich foods, protein, red meat, processed meat, legumes or pulses during study (self-reported).
ADHERENCE: COMMITMENT
6. Returns outcome assessment data of insufficient quality for analysis at baseline.
7. Is deemed not to meet an inclusion criterion prior to group allocation.

Date of first enrolment
16/05/2022

Date of final enrolment
15/10/2022

Locations

Countries of recruitment
Portugal

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Sponsor information

Organisation
Universidade Católica Portuguesa

Organisation
Universidade do Porto

Organisation
Sense Test, Sociedade de Estudos de Análise Sensorial a Produtos Alimentares, Lda

Funder(s)

Funder type
Government

Funder Name
Horizon 2020

Alternative Name(s)
EU Framework Programme for Research and Innovation, Horizon 2020 - Research and Innovation Framework Programme, European Union Framework Programme for Research and Innovation

Funding Body Type
Government organisation

Funding Body Subtype
National government

Location

Results and Publications

Individual participant data (IPD) sharing plan
The datasets generated during and/or analysed during the current study are not expected to be made available due to project consortium agreements regarding data management.

IPD sharing plan summary
Not expected to be made available

Study outputs

Output type	Details	Date created	Date added	Peer reviewed?	Patient-facing?
Other	Consumer sensory profiling and liking of Bolognese-type sauces	29/10	17/02		

publications		/2024	/2025	Yes	No
Other publications	Evaluation of innovative insect-based products by Portuguese consumers using a repeated exposure approach under a controlled setting	27/02 /2025	21/07 /2025	Yes	No
Study website	Study website	11/11 /2025	11/11 /2025	No	Yes