

# Testing how bread with different amounts of fiber affects blood sugar and insulin levels

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		<input type="checkbox"/> Protocol
<b>Registration date</b> 17/12/2024	<b>Overall study status</b> Ongoing	<input type="checkbox"/> Statistical analysis plan
		<input type="checkbox"/> Results
<b>Last Edited</b> 17/12/2024	<b>Condition category</b> Nutritional, Metabolic, Endocrine	<input type="checkbox"/> Individual participant data
		<input type="checkbox"/> Record updated in last year

## Plain English summary of protocol

### Background and study aims

The significance of dietary fibre in promoting human health has garnered attention, given its association with reducing the risk of cardiovascular disease, type 2 diabetes, and various cancers. Despite established guidelines recommending a daily fibre intake of 30g, UK adults typically consume only 18g per day. Cereals, particularly bread, contribute significantly to daily fibre intake, with much of it derived from low-fibre white bread. Consequently, there's a demand for consumer-accepted, high-fibre bread options. Wheat flour's major fibre components are arabinoxylan (AX) and  $\beta$ -glucan. Genetic variations in AX content have facilitated the production of high-AX bread at Rothamsted Research. The Wheat Study aims to evaluate the impact of bread samples, each varying in fibre content, on blood glucose and insulin metabolism.

### Who can participate?

Adults aged 18 to 65 years old who have a BMI of 18-30 kg/m<sup>2</sup>.

### What does the study involve?

Participants will complete a questionnaire and attend a screening visit where they will be seen by a doctor and asked about their medical history, current health, and any medications. Measurements of height, weight, waist and hip circumference, and body composition will be taken, and BMI will be calculated. They will also undergo a full blood test, and all females of childbearing potential will complete a pregnancy test. Following this, a glucose tolerance test will be performed. Participants will be given a large glass of concentrated sugar solution (75g of glucose dissolved in 250ml of water). Two hours after consuming the drink, another blood sample will be taken to measure plasma glucose levels.

Eligible participants will be invited to attend six study visits at the Clinical Research Facility at Hammersmith Hospital. At each visit, all females of childbearing potential will complete a pregnancy test. A small plastic tube (cannula) will be inserted into the participant's arm. During each test, participants will consume either a glucose drink or bread containing varying amounts of fiber. The order in which these foods are consumed will be randomized and not chosen by the participants. Bread samples will be prepared by the researcher following a standard recipe in the Imperial College Research Facility (ICRF) kitchen.

To measure blood sugar, insulin, and C-peptide levels, two fasting blood samples will be taken 10 minutes apart before the start of the study (-10, 0), before consuming any food or drink. Afterward, additional samples will be collected at six time points: 15, 30, 45, 60, 90, and 120 minutes post-consumption. Approximately 5 ml of blood (roughly a teaspoon) will be collected at each time point, amounting to a total of 40 ml of blood per session. These samples will be collected through the cannula. Measurements will continue for two hours after participants consume the test meal. Additionally, participants will be asked to complete a 24-hour food diary the day before each study visit. Participants will be reimbursed £10 for the screening visit and £25 for each study visit, with a total of £160 paid at the end of the study. An additional £15 will be reimbursed for travel expenses for each visit.

What are the possible benefits and risks of participating?

Although taking part in the study will provide no direct benefit to participants, the results will contribute to understanding how bread with varying amounts of fiber affects blood glucose responses. Additionally, if any of the screening questionnaires or blood tests reveal medical issues (e.g., diabetes, kidney, or liver problems), the participant's GP will be informed to coordinate further care, arrange any necessary tests, and refer the participant to a hospital specialist if needed. The insertion of the cannula during each study visit may cause minor discomfort or superficial bruising. However, these procedures will be performed by an experienced healthcare professional under sterile conditions to minimize these risks.

Where is the study run from?  
Imperial College London (UK)

When is the study starting and how long is it expected to run for?  
September 2024 to September 2026

Who is funding the study?  
Biotechnology & Biological Sciences Research Council (UK)

Who is the main contact?  
Prof Gary Frost, g.frost@imperial.ac.uk

## Contact information

### Type(s)

Public, Scientific, Principal investigator

### Contact name

Prof Gary Frost

### ORCID ID

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## Additional identifiers

### Clinical Trials Information System (CTIS)

Nil known

### Integrated Research Application System (IRAS)

340491

### ClinicalTrials.gov (NCT)

Nil known

### Protocol serial number

CPMS 64537, Biotechnology and Biological Sciences Research Council grant code: BB/X018849/1

## Study information

### Scientific Title

Glycemic and insulin metabolism testing of arabinoxylan-enriched bread

### Acronym

Wheat Study

### Study objectives

The study aims to assess the impact of 10 types of bread, each with different amounts of AX, on blood glucose and insulin metabolism.

### Ethics approval required

Ethics approval required

### Ethics approval(s)

approved 16/10/2024, London - Fulham Research Ethics Committee (2 Redman Place, Stratford, London, E20 1JQ, United Kingdom; +44 (0)207 104 8084; fulham.rec@hra.nhs.uk), ref: 24/LO/0671

### Study design

Randomized controlled trial

### Primary study design

Interventional

### Study type(s)

Treatment

### Health condition(s) or problem(s) studied

Other disorders of glucose regulation and pancreatic internal secretion

### Interventions

During the study visits, participants will be given either bread or a glucose solution. The 10 test breads will vary in fiber content, and each type of bread will be consumed once on separate

occasions. Each portion will provide either 25 g or 50 g of available carbohydrates. The reference food will be glucose solution.

Sealed Envelope software will be used to randomise participants to determine which dietary intervention they will be given for the first study period. Each participant will be randomized to 5 of the 10 test breads. Participants will attend a total of six study visits. Blood samples will be collected to assess blood glucose, insulin, and C-peptide levels.

### **Intervention Type**

Other

### **Phase**

Not Specified

### **Primary outcome(s)**

Blood glucose levels measured via the glycaemic response measured in blood samples collected by cannulation at 15, 30, 45, 60, 90, and 120 minutes post-consumption.

### **Key secondary outcome(s)**

Blood insulin and C-peptide levels measured in blood samples collected by cannulation at 15, 30, 45, 60, 90, and 120 minutes post-consumption.

### **Completion date**

01/09/2026

## **Eligibility**

### **Key inclusion criteria**

1. Age between 18-65 years (inclusive)
2. Body mass index (BMI) of 18-30 kg/m<sup>2</sup>
3. Willingness and ability to give written informed consent and willingness and ability to understand, to participate and to comply with the study requirements.

### **Participant type(s)**

Healthy volunteer

### **Healthy volunteers allowed**

No

### **Age group**

Adult

### **Lower age limit**

18 years

### **Upper age limit**

65 years

### **Sex**

All

## **Key exclusion criteria**

1. Screening blood results outside of normal reference values
2. Weight change of  $\geq 5$ kg in the preceding 2 months
3. Current smokers
4. History of substance abuse and/or excess alcohol intake
5. Pregnancy
6. Diabetes
7. Cardiovascular disease
8. Cancer
9. Gastrointestinal disease e.g. inflammatory bowel disease or irritable bowel syndrome
11. Kidney disease
12. Liver disease
13. Pancreatitis
14. Having polycystic ovary syndrome (PCOS)
15. Started new medication within the last 3 months likely to interfere with energy metabolism, appetite regulation and hormonal balance, including anti-inflammatory drugs or steroids, antibiotics, androgens, phenytoin, erythromycin or thyroid hormones.
16. Subjects who are currently participating in other clinical trials
17. Any blood donation within the 12 week period prior to entering this study
18. Subjects who are unable to give informed consent by themselves

## **Date of first enrolment**

02/01/2025

## **Date of final enrolment**

05/12/2025

## **Locations**

### **Countries of recruitment**

United Kingdom

England

### **Study participating centre**

**NIHR Imperial Clinical Research Facility**

Hammersmith Hospital

Du Cane Rd

Shepherd's Bush

London

United Kingdom

W12 0HS

## **Sponsor information**

**Organisation**

Imperial College London

**ROR**

<https://ror.org/041kmwe10>

**Funder(s)****Funder type**

Government

**Funder Name**

Biotechnology and Biological Sciences Research Council

**Alternative Name(s)**

UKRI - Biotechnology And Biological Sciences Research Council, Agricultural and Food Research Council, Biotechnology & Biological Sciences Research Council, BBSRC, BBSRC UK, AFRC

**Funding Body Type**

Government organisation

**Funding Body Subtype**

National government

**Location**

United Kingdom

**Results and Publications****Individual participant data (IPD) sharing plan**

The data-sharing plans for the current 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