PARTICIPANT INFORMATION SHEET

Sugar Ingestion Patterns (SIP) Study

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Thank you for showing interest in taking part in the Sugar Ingestion Patterns (SIP) Study. This information sheet is part of the process of informed consent. It should tell you what the research is about and what taking part will involve.

In this research study we will use information from you. We will only use information that we need for the research study. We will let very few people know your name or contact details, and only if they really need it for this study. Everyone involved in this study will keep your data safe and secure. We will also follow all privacy rules. At the end of the study, we will save some of the data in case we need to check it and for future research if you provide consent. We will make sure no-one can work out who you are from the reports we write.

Summary

We are running a research study to understand how sugar intake affects health, particularly blood fats (triglycerides). Higher levels of triglycerides can increase the risk of heart disease. We want to find out if drinking a sugary drink in one go, or slowly, has different effects on triglyceride levels and how the body processes sugar.

Who can take part?
You may be eligible to take part in this study if you are aged 18-65 years, and have a body mass index (BMI) between 18.5-29.9kg/m2 (normal to overweight).

You cannot take part if you:

- Have diabetes, certain metabolic conditions, allergies/intolerances or following a diet that prohibits to study foods (egg and dairy)
- Are pregnant or breastfeeding
- Recently lost/gained >5kg, taken part in other research studies, or take medicines that affect blood sugar/fat

What does taking part involve?
If eligible, you will have to attend 7 visits in total (4 at the University of Bath, 3 at a location that suits you). These include:

- A screening visit to confirm eligibility (we will measure height, weight, body composition, and ask you to complete questionnaires)
- Three (3) main trial days, each lasting 6-7 hours. On these days you will drink a test drink (either sugar or water), eat a study meal, and provide blood and breath samples while resting in the lab.
- Three short visits the evening before trial days to collect a blood sample and provide you with a pre-study drink known as “heavy” water.
  We will also ask you to provide 4-6 stool samples in total: one before, one or two after two of the trial days.
- OPTIONAL: you will be asked if you would like to provide an additional 40 mL blood donation.

Throughout this study, we will collect information about yourself, including: name, contact details, age, sex, general health, height, weight, body weight composition, dietary intake records, physical activity levels, blood and breath samples. Participation is entirely voluntary, and you may withdraw at any time without giving any reason.

Possible benefits:

- You will receive personalised results about your health, including body composition, diet, physical activity, and blood test results.
- Your participation will help us understand how sugar intake affects health and may inform future public health advice.

Possible disadvantages: Minor risks include bruising from blood sampling, mild dizziness from heavy water, and a very small radiation exposure from the DEXA scan (what we use to determine your body composition).

Expenses and payment: You will be reimbursed for reasonable travel costs and receive £75 for each main trial visit (£225 in total).

Please take time to read this information sheet carefully. Please ask one of the researchers named above if you have any questions or if there is anything that is not clear.

1. What is the purpose of the study?

This study is about understanding how sugar intake affects your body and overall health. Specifically, we are looking at triglycerides, a type of fat in your blood. High levels of triglycerides can increase the risk of long-term health problems such as heart disease. When you eat or drink sugar, your body breaks it down in different ways. Sometimes, when you eat excess sugar, your liver can turn on a process that turns this sugar into fat. Eating or drinking too much sugar, especially quickly, may increase this fat production and affect your health.

We want to find out if drinking sugar quickly in one go or slowly over time has different effects on triglyceride levels and your body's ability to process sugar. We also want to find out if higher doses of sugar end up in our stool. This research will help us understand how sugar consumption impacts short-term health and may provide clues about its long-term effects on public health.

2. Who take part in this study?

You can participate in the study if you meet the following criteria:

- Age: 18-65 years
- Body mass index (body weight in kg divided by height in metres squared): 18.5-29.9 kg/m^2. A link to calculate your BMI can be found here: https://www.nhs.uk/health-assessment-tools/calculate-your-body-mass-index/. We can also help you work this out during your screening visit.

You are not allowed to take part if you:

- Have lost or gained more than 5 kg within the last 6 months;
- Have been diagnosed with any form of diabetes or any conditions that affect your metabolism or unsuitable for this study;
- Have an intolerance or allergy to any of the study procedures (e.g. lactose intolerance, egg allergy, etc.);
- Are pregnant or lactating;
- Are following a vegan diet as you will be asked to consume a meal composed of egg and dairy;
- Have taken part in a research study in the last 6 months that has altered your metabolism or resulted in a blood donation larger than the NHS standard blood donation (more than 470mL);
- Do not speak English.

3. Do I have to take part?

No – participation in this study is completely voluntary, and it is up to you to decide whether or not to take part. If you do decide to take part, you will be asked to sign a consent form. However, you are still free to withdraw from the study at any time without giving a reason.

4. What would taking part involve?

Eligible participants will be asked to meet a member of the research team on 7 distinct occasions **(Figure 1).** Four of these meetings must take place at the Human

Physiology Laboratories at the University of Bath. The remaining three visits can take place at a location to suit you (for example, your home). The first occasion is a screening visit (at the laboratory), lasting no more than one hour. The subsequent visits comprise the main testing sessions (at the laboratories), in addition to a short meeting for a blood sample and to provide you with a drink the day before each main trial (this can take place at your home if you prefer). See **Table 1** for a detailed description of each study visit. Each main trial will take place 28±7 days apart from one another as so to give enough time for any effects from the previous trial to wear off. Each main testing session will last around 6-7 hours in total. Most of this time will be spent relaxing on a bed, and you will be able to watch television, read books and/or do some work on a laptop if you wish.

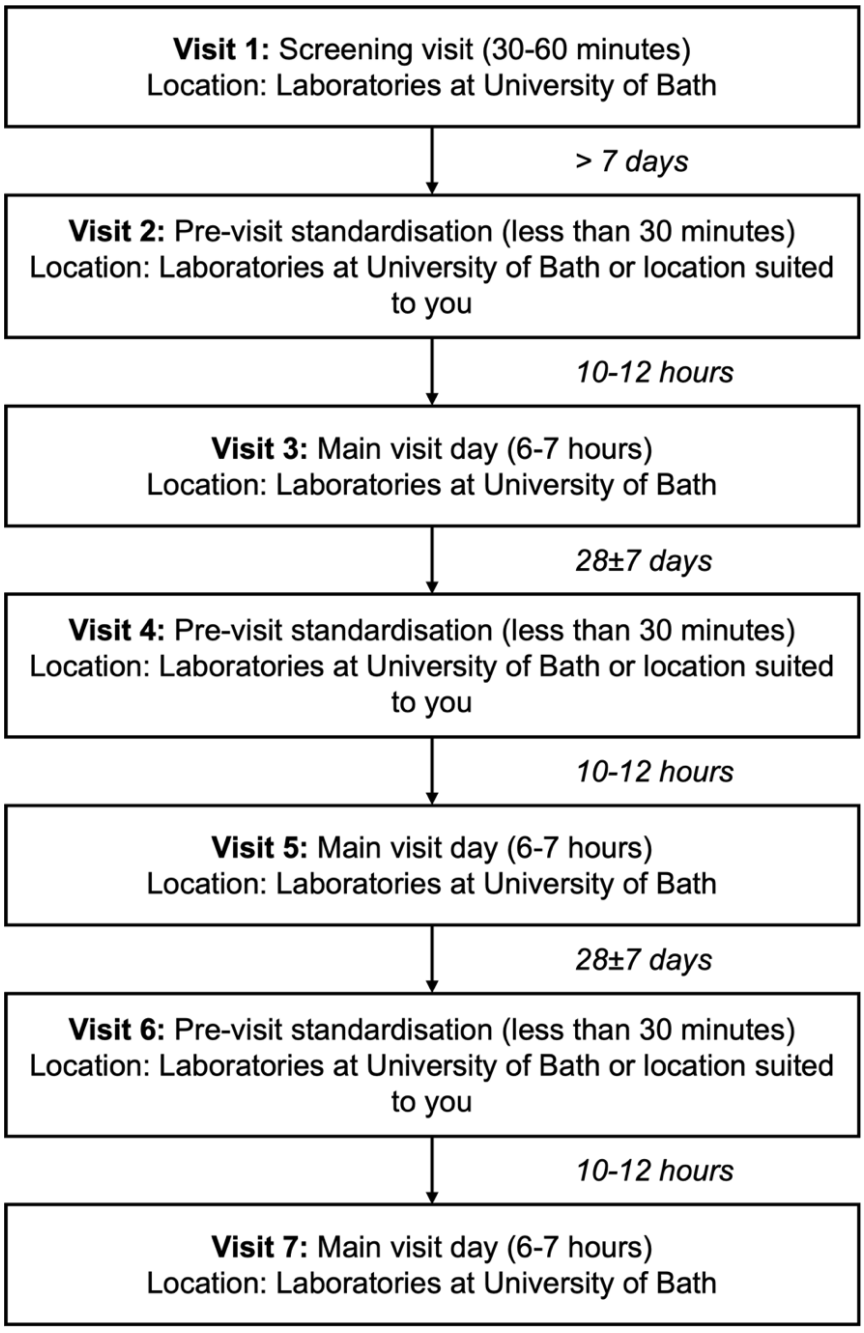

Figure 1. Flow diagram of the study for a participant's involvement.

Table 1 – Description of study visits

Title	Duration	Location	Description
Telephone pre-screening	10-15 minutes	NA	During a short phone call with a member of the research team, you can ask any questions or share any concerns about the study. We will ask general questions about your health, lifestyle, and dietary habits to assess whether you may be suitable for participation. No data will be recorded during this call.
Visit 1: Screening visit	30-60 minutes	University of Bath	If you meet the initial criteria, you'll be invited to the University of Bath for a screening visit. During this session, you can ask further questions and discuss the study in more detail. If you decide to participate, we will: • Ask you to sign consent form • Measure your height, weight and body composition using a dual-energy X-ray absorptiometry (DEXA) scan. • Ask you questions about your general health, dietary habits, and any allergies or intolerances to confirm your eligibility. If you are found to be ineligible at any stage, we will let you know immediately. Even if you are not eligible to continue in the full study, we will provide these data to you in a personalised feedback document. If you are confirmed to be eligible, we will then provide you with a physical activity monitor, a weighing scale and instructions on how to record your dietary intake, and a list of foods you should avoid in the 48hrs prior each study visit.
Visits 2, 4 and 6: Pre-trial evening visit	Less than 30 minutes	Location suited to you.	Before your first trial, we will ask you to record your diet and physical activity for the 48 hours before the visit. You will then be asked to repeat the same diet and activity before each later trial. We will also give you a list of foods to avoid, as these could interfere with our measurements. To help standardise things, we will provide you with an evening meal to eat before 9pm the night before each trial. After this meal, you should fast until the trial begins the next morning, although you may drink water freely. Before each trial, we will also ask you to provide a baseline stool sample. This lets us measure your normal levels of a harmless carbon marker (known as ^{13}C) so we can compare them with levels after you consume the test drink. Ideally, this sample will be collected on the morning of the trial, but a sample from the day before is also fine. You will collect the stool sample yourself using a home-kit. On the evening before each main trial, we will meet you to take a small blood sample (5 mL) and to provide you with a drink of "heavy water." This is very similar to normal water but contains a harmless heavier form of hydrogen, which helps us measure how sugar is converted into fat. To avoid any dizziness, the dose will be split into two smaller drinks taken about two hours apart. The body naturally contains small amounts of heavy water, and while your levels will be slightly higher for up to two months after the study, this has no effect on your health.
Visits 3, 5 and 7: Main study visit	6-7 hours	University of Bath	On the morning of each trial, you will be asked to arrive at the laboratory by car or public transport, having consumed nothing but water since 9pm the previous evening. After measuring your body weight, we will ask you to rest on a laboratory bed while we collect baseline samples. These will include two breath samples: one taken by breathing through a tube to measure how much carbohydrate and fat you are burning, and another taken by breathing into a bag so we can later determine how much of the fat comes from the test drink rather than your own body stores. We will then warm your hand in a heated-hand box (about 55˚C) and insert a small plastic cannula into a vein in the back of your hand. This allows us to draw blood samples regularly throughout the trial without repeated needle insertions. An initial larger blood sample (30 mL, about two tablespoons) will be collected at this stage. You will then be given your test drink and a high-fat meal. The drink will be different on each trial: one will contain a large sugar dose, one will contain smaller sugar doses spaced across the day, and one will contain only water. This drink will be blue in colour so that subsequent stool samples are stained blue/green. During the trial, you will also be able to drink up to 500 mL of filtered water containing a very small amount of "heavy water." This is safe to consume and helps us track how sugar is turned into fat.

			After ingesting the meal and drink, you will remain at rest on the bed for six hours. During this time you may watch television, read, or use a laptop. Every hour, we will take further breath samples and small blood samples (10 mL each). At the end of the six-hour period, the trial will finish, and you will be provided with lunch on campus. After this point, you are free to eat and drink as you wish. After the trial days, we will ask you to collect one or two stool samples at home. The test drink includes a small amount of blue food dye, so you will simply collect the next stool that appears blue or green in colour. This helps us know when the drink has reached the end of your gut and allows us to measure how much of the labelled sugar has passed through. You will collect the stool sample(s) yourself using a home-kit. Visits 3, 5 and 7 will follow the same procedure, with the only difference being the test drink provided (see Figure 2).

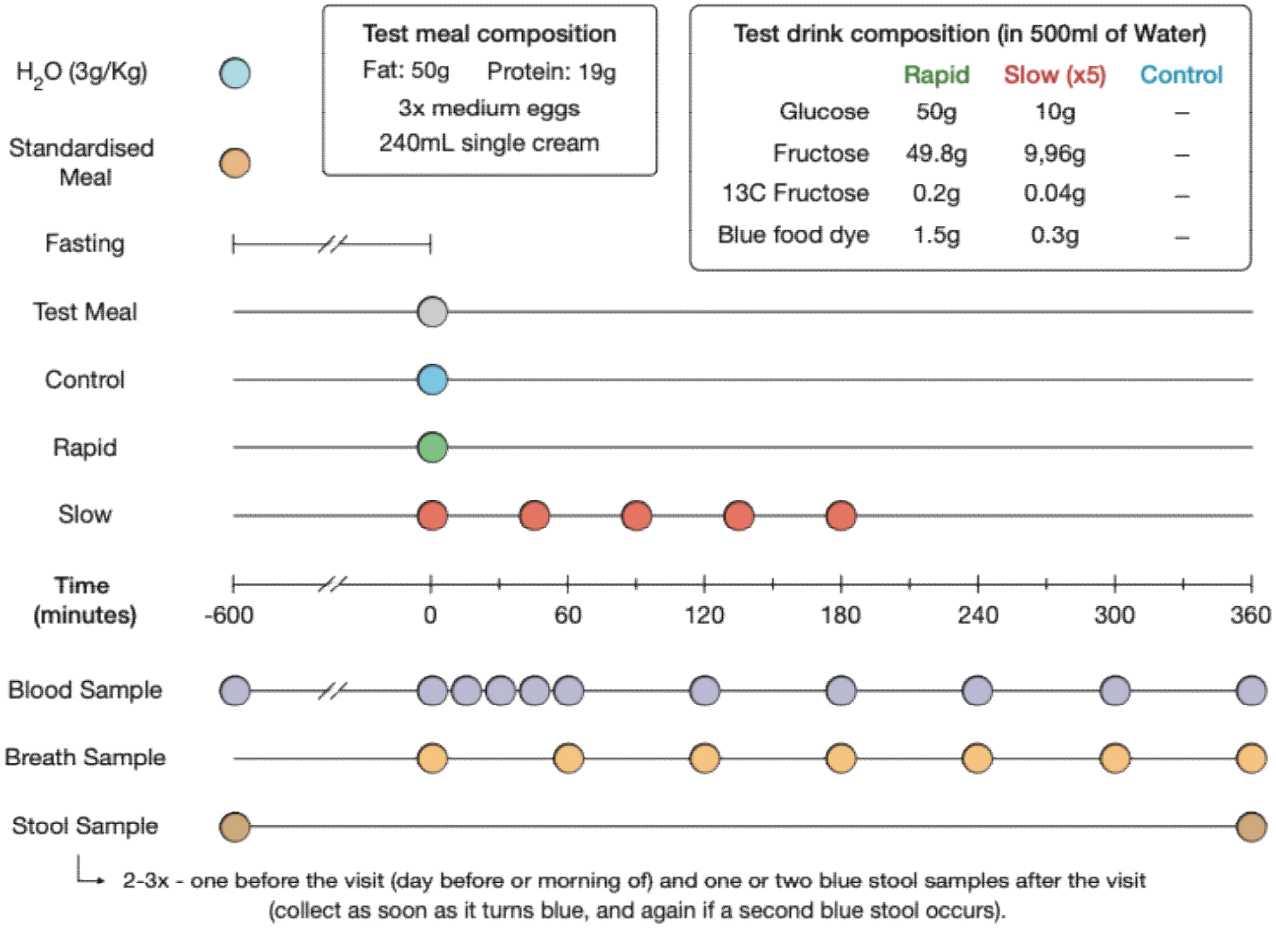

Figure 2. Schematic of main visit days.

If you consent to donating an optional 40 mL blood sample, we will arrange this at a random time and location that suits you.

5. What are the possible benefits of taking part?

You will be provided with a personalised summary of your own results including body composition from a DEXA scan, physical activity levels, dietary analysis and blood test results. More broadly, the information that you and the other participants provide in this project will help us to better understand how sugar consumption patterns affect our metabolic health and may help inform on long-term effects on public health.

6. What are the possible disadvantages and risks of taking part?

Beyond being asked to give up your time, as described above, there are inherent minor risks associated with some of the procedures involved in this study.

Ionising Radiation: If you take part in this study, you will have a dual-energy x-ray absorptiometry scan (DEXA), which you would not have if you did not participate. This procedure uses ionising radiation to measure body fat, muscle, and bone. Ionising radiation can cause cell damage that may, after many years or decades, turn cancerous. We are all at risk of developing cancer during our lifetime. 50% of the population is likely to develop one of the many forms of cancer at some stage during our lifetime. Taking part in this study will add only a very small chance of this happening to you (0.00005%). However, if you suspect you may be pregnant, please inform us as soon as possible and before you participate in the DEXA scanning.

Blood Sampling: You may experience some discomfort or bruising from blood sampling, but all procedures will be performed by trained staff who will take care to minimise this. A small plastic tube (cannula) will be inserted to allow repeated blood samples so to eliminate the need for repeated needle sticks. This carries a very small riskm of infection or blockage, but such events are extremely rare. Across the whole study, a total of 450 mL of blood will be taken (140 mL per trial visit and 10mL for each pre-trial standardisation), which is less a standard NHS blood donation. The maximum collected on any one day will be 140mL, taken in small samples from the cannula. As with any medical procedure involving blood or tissue sampling, there is an increased risk of syncope (fainting). To minimise this risk, we will ensure you are well hydrated, comfortable, and seated or lying down. If you feel at all faint during the procedure we can stop the process immediately.

Ingestion of Heavy Water: Regular water is made up of molecules known as hydrogen and oxygen. Heavy water is similar to regular water, but the hydrogen in it is slightly heavier. Our bodies use hydrogen to make new blood fats, so by drinking heavy water, this allows us to “track” which fat molecules are newly made new and which are already in your blood.

Drinking it in small amounts we use for this study is safe. In some people, the ingestion of heavy water can produce a feeling of “dizziness”. To prevent this, we will split the dose into two. We will also ask you to consume this at a time when you are seated and comfortable, especially for the first trial.

7. Will my participation involve any discomfort or embarrassment?
Whilst some of the sampling and testing techniques involved may be associated with some discomfort at the time, we do not expect you to feel any extended discomfort. No elements of this study are expected to make you feel embarrassed. If at any time you feel, or appear to be, uncomfortable then we will end the testing immediately.

8. Travel and expenses
Reasonable travel expenses for visits to the University of Bath will be reimbursed on production of receipts or via claims for mileage. You will also be offered £75 per main laboratory visit (a total of **£225** for all three main visits).

9. **Who will have access to the information that I provide?**
Only the PhD Researcher (Benedita Deslandes), the Chief Investigator (Professor Emma Vincent), and the Principal Investigator (Professor Javier Gonzalez) will have access to your personal information. All records, including personal contact details, will be treated as confidential. Your data will be assigned a participant number so that people who do not need to know who you are will not see your name or contact details.

Anonymised data may be shared with other members of the research team during the analysis or publication, including our research collaborators at the University of Bath, University of Swansea and University of Oxford. No personally identifiable information would be shared in any communication or publication.

Your physical activity data from your Garmin device will remain anonymised on Garmin's servers. If you consent, the research team will access this data through an anonymised account for study purposes.

10. What will happen to the data collected and results of the study?
The data collected will be used to understand the effects sugar consumption patterns on blood lipid (fat) levels. We will treat all information that you provide as confidential and store it securely in a password-protected, encrypted servers managed by the University of Bristol, and paper forms kept in a locked cabinet. Your data will not be shared outside the UK. Your personal data will only be accessible the PhD Researcher (Benedita Deslandes), Chief Investigator (Prof Emma Vincent), and the Principal Investigator (Prof Javier Gonzalez).

Data will be retained for a minimum of 10 years in accordance to the UK General Data Protection Regulation (UK GDPR) and the Data Protection Act 2018. After this, data will be fully anonymised and securely archived or destroyed. Your name or any other identifying information will not be disclosed in any presentation or publication of the research. After the study has finished, you may request a summary of the results if you would like. This summary will not include any identifiable information and will only show the overall findings of the project.

If you consent, your anonymised data may be used in future ethically approved research at the University of Bristol, University of Bath or other institutions in the UK. If you do not consent, your data will remain stored securely for auditing purposes only.

You can find out more about how we use your information by asking one of the research team or by sending an email to the Data Protection Officer at data-protection@bristol.ac.uk. You can also visit www.hra.nhs.uk/patientdataandresearch.

11. **What will happen to any samples that I give?**
Samples will be stored in secure, ultralow temperature at the University of Bath, accessible only to research staff. Samples will be predominantly analysed at the University of Bristol and the University of Bath, with some analysis of the anonymised samples being performed in other research locations in the UK:

- University of Oxford, UK (for blood sample analysis)
- Novogene, Cambridge, UK (for blood sample analysis)
- Sercon Analytical Ltd, Crewe, UK (for breath sample analysis)

If you consent, we will store your samples for use in future ethically approved research studies up to 10 years after the end of this study. If you **do not** wish us to store your samples for this purpose, then once the PhD studentship is complete and the results are published, the samples will be destroyed in accordance with the Human Tissue Authority's Code of Practice.

12. **How can I withdraw from the study?**
You can stop participating at any time without giving any reason, even **before** completing all parts of the study. You can do so by informing one of the above identified researchers in person or by email. If you withdraw from the study, we will keep your information and data unless you specifically request this. Thereafter, your information and data will be destroyed.

In line with the UK GDPR and the Data Protection Act 2018, your rights to access, change or move your information are limited, as we need to manage your information in specific ways for the research to be reliable and accurate. At the **end** of the study, there will be a **two-week** grace period before samples are anonymized and analysis begins. During this time, you are free to withdraw your data. However, once this grace period has passed, it may no longer be possible to withdraw it.

To safeguard your rights, we will use the minimum personally identifiable information possible. The only people who will have access to information that identifies you will be people who need to contact you – research team members or the research governance team at the University of Bristol. The University of Bristol will keep identifiable information about you from this study for at least 10 years.

13. Who has reviewed this study?
This project has been given a favourable opinion by the NHS Health Research Authority Research Ethics Committee (Reference: 352907). The project will be continuously monitored by the University of Bristol and at the University of Bath.

14. University of Bristol privacy notice
The University of Bristol privacy notice can be found here:
https://www.bristol.ac.uk/secretary/data-protection/policy/research-participant-fair-processing-notice/

15. What happens if there is a problem?
If you have a concern about any aspect of the project you should ask to speak to the researchers, and we will do our best to answer any questions. If we are unable to resolve your concern, or you wish to make a complaint regarding the project, please contact the research governance team: research-governance@bristol.ac.uk.

16. Who is organizing and funding the study?
The Chief Investigator is Professor Emma Vincent from the University of Bristol (emma.vincent@bristol.ac.uk). The study is funded by the Wellcome Trust and sponsored by the University of Bristol.

17. If I require further information from the study, who should I contact and how?
If you feel that you are eligible and might like to participate in this study, or you would like some more information or to discuss the above information further before making your decision, please get in touch with either Benedita Deslandes (PhD Researcher), Professor Emma Vincent (Chief investigator), or Professor Javier Gonzalez (Principal investigator). Contact details can be found at the beginning of this document.

Please discuss this information with your family, friends or GP if you wish.
Thank you for your interest in this study.