If appropriate for this study, a scanned copy of the signed consent form should be uploaded to the participant's Epic/EMR record.

Patient I.D. plate

RESEARCH PARTICIPANT INFORMED CONSENT AND PRIVACY AUTHORIZATION FORM

Protocol Title: **Night Owl Metabolism: Investigating the Impact of Chronotype on Glucose Metabolism in Youth**

Application No.: **IRB00428863**

Funded By: **NIH/NIDDK, Pediatric Endocrine Society**

Principal Investigator: **Talia Hitt, MD MPH MSHP**
200 N. Wolfe St, Suite 3120
Baltimore, MD 21287
(410) 510-6463

You are being asked to join a research study. Participation in this study is voluntary. Even if you decide to join now, you can change your mind later.

1. Research Summary (Key Information):

The information in this section is intended to be an introduction to the study only. Complete details of the study are listed in the sections below. If you are considering participation in the study, the entire document should be discussed with you before you make your final decision. You can ask questions about the study now and at any time in the future.

Sleep is an important factor that impacts a person's overall health. In adults, shortened sleep duration (not getting enough sleep) as well as altered sleep timing (going to bed very late) have been shown to be associated with decreased glucose metabolism, which is a risk factor for developing type 2 diabetes. However, later sleep timing is a normal part of development in teens and young adults, and it is not known whether the relationships seen in older adults also apply to youth and young adults. The goal of this study is to examine the relationship between sleep timing and measurements of glucose metabolism done at different times of day.

Participation in this study involves a screening call, one virtual study visit (on Zoom), and three in-person visits to the Johns Hopkins Hospital. At two of the in-person visits, you will undergo an oral glucose tolerance test (OGTT), which measures your body's response to sugar. For the third in-person visit you will receive the placing of a continuous glucose monitor (CGM). You will also be asked to wear an actiwatch, a device that measures movement and sleep, for a total of 19 days and a continuous glucose monitor, a device that measures blood sugar, for 8 days.

There is an additional optional overnight sleep study that you may elect to do in addition to these study procedures. Individuals between the ages of 18 and 23 years who have a BMI between the 25-30 $\frac{kg}{m^2}$ may participate.

All procedures during the study will be paid for by the study and will be of no cost to the participant. Participants will be compensated for their time in the study. The information we learn in this study may help us to better understand the association between sleep and glucose metabolism, but participation in this study is not expected to benefit you directly. There are risks to participating in this study that are discussed later in this document.

2. Why is this research being done?

This research is being done to investigate the relationship between sleep timing and glucose metabolism in youth and young adults.

The prevalence of youth-onset type 2 diabetes has dramatically increased in past years, and scientists are interested in better understanding risk-factors for developing youth-onset type 2 diabetes. Sleep is one possible risk factor: in studies of adults, shortened sleep duration and later sleep timing were associated with increased blood sugar and decreased insulin sensitivity, both of which are risk factors for type 2 diabetes. However, normal development naturally results in later sleep timing in youth and young adults, and the tests for diabetes in these studies are typically conducted in the morning, when youth would otherwise be asleep. Because of this, it is not known whether delayed sleep is also a risk factor for type 2 diabetes in youth.

This study conducts oral glucose tolerance tests (OGTTs) at two times, early (better aligned with the sleep patterns of youth who go to bed early) and late (better aligned with the sleep patterns of youth who go to bed late) to determine whether the timing of this test impacts its results. It then assesses glucose metabolism in a real-world setting, by having participants eat a standardized breakfast meal replacement shake at an early time and a later time while wearing a continuous glucose monitor to assess how participants' blood sugar responds based on the time of this first meal. The results of these tests may allow us to detect prediabetes and diabetes. Early detection could be helpful to your long term health.

Are there any investigational drugs/devices/procedures?

No. Both actiwatches and continuous glucose monitors (CGMs) are approved by the FDA for use in this population.

Who can join this study?

People between the ages of 18 and 23 years who have a BMI between 25-30 $\frac{kg}{m^2}$ may join.

How many people will be in this study?

This study aims to enroll 70 participants, 35 who go to sleep early and 35 who go to sleep late.

3. What will happen if you join this study?

If you agree to be in this study, we will ask you to do the following things:

- Screening visit: A member of the study team will meet with you via Zoom and have you complete some short surveys and answer questions to confirm your eligibility for the study.
- Virtual visit 1: A member of the study team will meet with you via Zoom to review use of the actiwatch and confirm the schedule of upcoming visits. You will begin to wear the actiwatch and will continue for the next 11 days. While wearing the actiwatch, you will receive twice-daily sleep diary surveys that will be texted or emailed to you, starting the morning following this visit.

- In-person visit #1:
  - OGTT: You will come in-person to the hospital to have your first oral glucose tolerance test (OGTT). This test will be done at 8:30 AM or 12:30 PM. You must fast (nothing but water to eat or drink) overnight prior to this visit. This test tells how well your body deals with sugar. The test includes placement of an intravenous (IV) line in your arm/hand to make taking the blood samples easier. With the IV in place, you will not need to be stuck again for any further blood draws. Once the IV is in place, you will receive a sugar drink (Glucola) that tastes like a very sweet flat soda. You will have about 2 minutes to finish the drink. Over approximately 2 hours, blood will be drawn 8 times from your IV line to measure your blood glucose (sugar) levels. The total amount of blood drawn for the OGTT will be about 100 mL or 6 tablespoons. The study team will inform you if the OGTT reveals any abnormalities such as diabetes. With your permission we can send the clinically relevant lab results to your doctor.
  - Medical history: At this visit, we will also ask you questions about your medical history and medications you take.
  - Anthropometric measurements: Exams will be conducted during the study visit including weight, height, blood pressure, heart rate, etc by a nurse or member of the study team.
- In-person visit #2: One week later, you will return to the hospital for your second OGTT, following the same procedure as above. At this time you will remove the actiwatch and return it to the study team.
- In-person visit #3: We will give you a second actiwatch, continuous glucose monitor (CGM), and meal-replacement shakes and discuss the next portion of the study. A member of the study team will meet with you to review the next phase of the study and will assist in placing the CGM. You will begin wearing the second actiwatch and will resume twice-daily sleep diary surveys, starting the following morning.
- Meal-replacement shakes: You will be asked to fast overnight and eat the meal-replacement shake as your first meal of the day at 8:30am and 12:30pm on 2 days one-week apart. You will also wear the actiwatch and the CGM for 8 days (including both days of meal-replacement). You will then remove the CGM and actiwatch and return them to us in the mail in a pre-labeled box.
- If any of the tests find an abnormality in your blood sugar we will discuss the implications for your health.

Some participants will be asked to do an additional overnight in-lab sleep study as part of this study. This procedure is described in greater detail in Section 18 ("Optional Study Components").

Will research test results be shared with you?
This study involves research tests that may produce information that could be useful for your clinical care, including results of the OGTT and other blood tests. We will share this information with you.

How long will you be in the study?
You will be in this study for 1-2 months, until completion of study procedures. If you participate in the optional overnight sleep study, you may be in the study for an additional month to allow for scheduling.

4. What happens to data and biospecimens that are collected in the study?

If you join this study, your data and biospecimens will be used to answer the research question and your data will be used to publish the findings of this study. Examples of biospecimens include blood, tissue, saliva, urine, bone marrow, cells, etc. The specific types of biospecimens that will be collected in this study are described in Section 3 of this document. Most biospecimens contain DNA, which is the genetic code for each person.

You will not own the data and/or biospecimens collected from you as part of this research study. If researchers use them to create a new product or idea, including those that may have commercial value, you will not benefit financially from those efforts.

Johns Hopkins researchers and their collaborators may use the data/biospecimens collected in this study for future research purposes and may share some of the data/biospecimens with others.

Because science constantly advances, we do not yet know what future use of research data or biospecimens may include. This future research may be unrelated to the current study and may include outside collaborators.

Sharing data and/or biospecimens is part of research and may increase what we can learn from this study. Often, data/biospecimen sharing is required as a condition of funding or for publishing study results. It also is needed to allow other researchers to validate study findings and to come up with new ideas. Your data and/or biospecimens may be shared with researchers at Johns Hopkins and other institutions, for-profit companies, sponsors, government agencies, and other research partners. Your data and/or biospecimens may also be put in government or other databases/repositories.

We (Johns Hopkins) will do our best to protect and maintain your data/biospecimens in a safe way. One of the ways we protect data/biospecimens is by limiting the uses of the information and the type of information that is shared, especially your personal information. This may occur through data/specimen sharing agreements and review by oversight groups within Johns Hopkins.

If data/biospecimens are used or shared with types of information that may be likely to identify you, such as your name, address or medical record number, further institutional review and approval would be required. In these cases, Johns Hopkins will review whether additional consent from you is required.

Generally, if your data/biospecimens are used/shared without any personal identifiers or with information that is less likely to identify you (such as the date of a procedure), further review and approval is not needed.

Data/biospecimen sharing could change over time, and may continue after the study ends.

The use and sharing of your data and biospecimens are required for participation in this research study. **If you are not comfortable with the use and sharing of your data/biospecimens in future research without further consent, you should not participate in this study.**

5. Open Access Data Sharing

In addition to the types of data sharing that are described in Section 4, this study involves sharing of data via open access.

Open access data sharing includes the following:

- Removal of any personal information from the study data that could identify you (like name, birthdate, age, gender, address including zip code, medical record number, etc.). This is called de-identified data.
- Each participant's data will be assigned to a code number to distinguish one study participant from another.
- De-identified data from this study are made publicly available (e.g. on a website).
- Anyone can use the data for any purpose in the future.

Participation in this study requires that you agree to this open access data sharing.

What risks and benefits are associated with open access data sharing?
Any research data collected from you, excluding your personally identifiable information, could be included in the open data sharing. However, even with your identifiable information removed, there may be a risk of you being identified. Anybody in the world can have access to information in an open access database. If you tell other people that you participated in this study, you may increase the chance that someone will be able to link your data to you.

We do not know how likely it is that your identity could become re-connected with information shared through open access. As of today, we believe there is a low risk that most de-identified study data could be used to re-identify you. However, data that cannot be used to identify you today could be used to identify you in the future.

If you decide to withdraw from the study after consenting to open data sharing, we will not have any way to know who has already used your data before you withdrew and will not be able to prevent continued use of your data.

There is no direct benefit to you from placing your data in an open access database. If you agree to open data sharing, this will help a wider range of researchers make discoveries that may help others in the future.

6. What are the risks or discomforts of the study?

Oral Glucose Tolerance Test (OGTT)
Oral glucose tolerance tests may cause temporary low blood sugar (hypoglycemia), which occurs in 20-25% of people. Low blood sugar can cause headaches or may make you feel dizzy, shaky, or sweaty. There is also a small risk of an upset stomach when drinking the sugary drink. We will monitor you for these side effects and can stop the test at any point.

Blood Draw
Taking blood may cause discomfort, bleeding, or bruising where the needle enters the body. In rare cases, it may result in fainting. There is a small risk of infection.

Continuous Glucose Monitor (CGM)
Wearing a CGM may cause skin irritation under the adhesive or bruising at the insertion site. There is a small risk of infection.

Standardized Meal
You may be asked to eat at a time that is different from your usual schedule. You may also dislike the food provided.

Actiwatch
The main risk with wearing the actiwatch is a potential skin rash on your wrist.

Interviews or questionnaires
You may get tired or bored when we are asking you questions or you are completing questionnaires. You do not have to answer any question you do not want to answer.

Identifiable private information
There is the risk that information about you may become known to people outside this study.

7. Are there risks related to pregnancy?

There is no known risk to an embryo or fetus from the procedures in this study.

8. Are there benefits to being in the study?

There is no direct benefit to you from being in this study. If you take part in this study, you may help others in the future.

9. What are your options if you do not want to be in the study?

You do not have to join this study. Other options include continuing your routine care with your healthcare team. If you do not join, your care at Johns Hopkins will not be affected.

10. Will it cost you anything to be in this study?

You will receive a separate Insurance and Research Participant Financial Responsibility Information Sheet. This Sheet will give you the following information:

- The procedures, tests, drugs or devices that are part of this research and that will be paid for by the study (no cost to you).

It may also include the following, if applicable for the study:

- The procedures, tests, drugs or devices that will be billed to you and/or your health insurer. If you have health insurance, you will be responsible for any co-pays or deductibles not covered by your insurance.

We are required to collect information about your health insurance to register you in our medical record system as a participant and for billing, if applicable.

11. Will you be paid if you join this study?

You will be paid as detailed in the compensation table below.

Procedure	Compensation
Aim 1:	
OGTT 1 Completion	$150
OGTT 2 Completion	$75
Watch Returned	$25
Half of Data Present on Watch and Sleep Diary	$25
Additional Bonus for Full Data on Watch and Sleep Diary	$50
Maximum total for Aim 1	$325
Aim 2:	
Placement of CGM Completion	$25
Watch Returned	$50
CGM Returned	$50
Half of Data Present on Watch and Sleep Diary	$25
Half of Data on CGM	$25
Additional Bonus for Full Data on Watch/Sleep Diary/CGM	$50
Maximum total for Aim 2	$225
Aim 3 (substudy):	
DLMOn/DLMOff	$500
Maximum total for Aim 3	$500
Maximum Compensation	$1,050

You may be required to provide your social security number to be paid for taking part in this study. Federal tax law requires that you report your research payments when you file your taxes. If your total payments from Johns Hopkins exceed $600 per year, Johns Hopkins will report these payments to the Internal Revenue Service and you will receive a 1099-MISC form from us.

12. Can you leave the study early?

- You can agree to be in the study now and change your mind later.
- If you wish to stop, please tell us right away.
- Leaving this study early will not stop you from getting regular medical care.

If you leave the study early, Johns Hopkins may use or share your health information that it has already collected if the information is needed for this study or any follow-up activities.

13. Why might we take you out of the study early?

You may be taken out of the study if:

- Staying in the study would be harmful.
- You need treatment not allowed in the study.
- You fail to follow instructions.
- The study is cancelled.
- There may be other reasons to take you out of the study that we do not know at this time.

If you are taken out of the study early, Johns Hopkins may use or give out your health information that it has already collected if the information is needed for this study or any follow-up activities.

14. How will your privacy be maintained and how will the confidentiality of your data be protected?

HIPAA Authorization for Disclosure of Protected Health Information
What information is being collected, used, or shared?
To do this research, we will need to collect, use, and share your private health information. By signing this document, you agree that your health care providers (including both Johns Hopkins Medicine and others) may release your private health information to us, and that we may use any and all of your information that the study team believes it needs to conduct the study. Your private information may include things learned from the procedures described in this consent form, as well as information from your medical record (which may include information such as HIV status, drug, alcohol or STD treatment, genetic test results, or mental health treatment).

Who will see, use or share the information?
The people who may request, receive, or use your private health information include the researchers and their staff who may be a part of Johns Hopkins Health System, Johns Hopkins University or the Johns Hopkins Applied Physics Laboratory. Additionally, we may share your information with other people at Johns Hopkins, for example if needed for your clinical care or study oversight. To improve coordination of your research and clinical care, some information about the study you join will be included in your electronic medical record.

By signing this form, you give permission to the research team to share your information with others outside of Johns Hopkins. This may include the sponsor of the study and its agents or contractors, outside providers, study safety monitors, government agencies, other sites in the study, data managers and other agents and contractors used by the study team.

We try to make sure that everyone who sees your information keeps it confidential, but we cannot guarantee that your information will not be shared with others. If your information is disclosed by your health care providers or the research team to others, federal and state confidentiality laws may no longer protect it.

Do you have to sign this Authorization?
You do not have to sign this Authorization, but if you do not, you may not join the study.

How long will your information be used or shared?
Your Authorization for the collection, use, and sharing of your information does not expire. Additionally, you agree that your information may be used for similar or related future research studies.

What if you change your mind?
You may change your mind and cancel this Authorization at any time. If you cancel, you must contact the Principal Investigator in writing to let them know by using the contact information provided in this consent form. Your cancellation will not affect information already collected in the study, or information that has already been shared with others before you cancelled your authorization.

How will your information be protected?
Your information will be protected by using a unique study identifier in place of information that could easily identify you. Paper records will be stored in locked cabinets, and digital records will be stored in Johns Hopkins approved servers for data containing identifiable information. Only approved study team members will have access to your identifiable information.

15. What is an Electronic Medical Record (EMR) and what research information may be included in the EMR?

An Electronic Medical Record (EMR) is an electronic version of your medical chart. If you do not already have an EMR at Johns Hopkins, one may be created for this study. Some information from this study will be put in your EMR. Examples include your consent form, test results, and scheduled procedures as well as any communications with the study team or assessments completed through MyChart, a portal used by patients to access their EMR. This information will be visible to any of your providers who view your EMR.

The information in your EMR may also be used and shared consistent with other medical information about you as described in the Johns Hopkins Notice of Privacy Practices.

Information within your EMR can be accessible to others (e.g., health insurance company, life insurance company, disability provider, third-parties specified in this consent). It is possible this information could be used to make decisions about coverage.

If you have any questions about what information may be added to your EMR from participating in this research, please ask the study team. **If you do not want information from this research study included in your medical record you should not participate in this study**.

16. What other things should you know about this research study?

During the study, we will tell you if we learn any new information that might affect whether you wish to continue to participate.

A description of this clinical trial will be available on http://www.ClinicalTrials.gov, as required by U.S. Law. This Web site will not include information that can identify you. At most, the Web site will include a summary of the results. You can search this Web site at any time. If you would like to review the information for this study, or a summary of the results, ask the study team doctor for the ClinicalTrials.gov study registration number.

What is the Institutional Review Board (IRB) and how does it protect you?
This study has been reviewed by an Institutional Review Board (IRB), a group of people that reviews human research studies. The IRB can help you if you have questions about your rights as a research participant or if you have other questions, concerns or complaints about this research study. You may contact the IRB at 410-502-2092 or jhmeirb@jhmi.edu.

What should you do if you have questions about the study?
Call the principal investigator, Talia Hitt at (410) 955-6463. If you wish, you may contact the principal investigator by letter. The address is on page one of this consent form. If you cannot reach the principal investigator or wish to talk to someone else, call the IRB office at 410-502-2092.

17. Optional Study Components:

This part of the consent form is about optional component(s) of the study that you can choose to take part in or not. You can still take part in the main study even if you say "no" to this/these optional component(s).

Optional Overnight Sleep Study

This supplemental overnight sleep study procedure collects saliva samples over the course of several hours to track the rise and fall of melatonin, a hormone that helps regulate sleep. This information will be used to assess your circadian rhythm, to help us better interpret the results of your actigraph watch, oral glucose tolerance tests (OGTTs) and continuous glucose monitor (CGM). It may also help us understand the mechanism behind changes in glucose metabolism over the course of the day.

If you elect to do the overnight sleep study, you will be asked to do the following:

- You will come to the Johns Hopkins Bayview Clinical Research Unit in the mid-afternoon on your scheduled visit day. Several hours before you typically go to sleep, you will enter a dimly-lit room and will be instructed to begin collecting saliva samples in provided tubes at a regular interval. A study nurse or member of the study team will remind you when it is time to collect the sample.
- You will continue collecting samples until a few hours after your typical bedtime, at which time you may go to sleep. A study nurse or member of the study team will wake you up a few hours before you typically wake up, and you will resume collecting saliva samples at a regular interval. A few hours after your typical wake-up time, you will finish collecting samples and will leave the visit.

Risks of this procedure include shortened or less restful sleep due to the environment of the sleep lab. You may also become bored between giving samples. You will be permitted to use your cell phone on the lowest brightness setting and/or watch television. You may end your participation at any time.

You will be paid an additional $500 for completion of this optional study component.

Please select whether you consent to doing this optional component of the study. Of note, only 24 participants will undergo the additional sleep study, 12 who go to sleep early and 12 who go to sleep late, so we cannot guarantee you will be invited to participate in this component even if you consent to it.

Please sign and date your choice below:

YES ☐ _____ _____
Signature of Participant Date
(or Parent/Legally Authorized Representative Signature, if applicable)

NO ☐ _____ _____
Signature of Participant Date
(or Parent/Legally Authorized Representative Signature, if applicable)

Future Contact

We would like your permission for our research team to contact you in the future. Please note that your decision below does not prevent other researchers at Johns Hopkins from contacting you about other research.

Please sign and date your choice below:

YES ☐ _____ _____
Signature of Participant Date
(or Parent/Legally Authorized Representative Signature, if applicable)

NO ☐ _____ _____
Signature of Participant Date
(or Parent/Legally Authorized Representative Signature, if applicable)

Sharing Results with Your Medical Provider

We would like your permission to share any medically-relevant test results with your healthcare provider(s) to ensure appropriate follow-up care.

Please sign and date your choice below:

YES ☐ _____ _____
Signature of Participant Date
(or Parent/Legally Authorized Representative Signature, if applicable)

NO ☐ _____ _____
Signature of Participant Date
(or Parent/Legally Authorized Representative Signature, if applicable)

18. What does your signature on this consent form mean?

Your signature on this form means that you have reviewed the information in this form, you have had a chance to ask questions, and you agree to join the study. You will not give up any legal rights by signing this consent form.

WE WILL GIVE YOU A COPY OF THIS SIGNED AND DATED CONSENT FORM

Signature of Participant	(Print Name)	Date/Time

Signature of Person Obtaining Consent	(Print Name)	Date/Time

I have received the separate Insurance and Research Participant Financial Responsibility Information Sheet.

Signature of Participant, LAR or Parent/Guardian	(Print Name)	Date/Time

NOTE: A COPY OF THE SIGNED, DATED CONSENT FORM MUST BE KEPT BY THE PRINCIPAL INVESTIGATOR AND A COPY MUST BE GIVEN TO THE PARTICIPANT. IF APPROPRIATE FOR THIS STUDY, A SCANNED COPY OF THE SIGNED CONSENT FORM SHOULD BE UPLOADED TO THE PARTICIPANT'S EPIC/EMR RECORD (UNLESS NO MEDICAL RECORD EXISTS OR WILL BE CREATED).