

## BACKGROUND

The gut microbiome (GM) is a growing field with incredible health potential. The metabolites created by this microscopic environment are used in almost every bodily system (Thursby & Juge, 2017). Exercise has been shown to improve the quality and function of the GM by increasing beneficial metabolites (Clarke et al., 2014). Conversely, few studies have shown how hormonal birth control (HBC) may have a minor negative impact on the GM (Mihajlovic et al., 2021). No study has compared the two against each other across the menstrual cycle. Therefore, the motivation behind this study is:

- (1) See if HBC could potentially negatively impact the GM
- (2) If so, could this be offset by exercise
- (3) Bring representation to the underrepresented female athlete

## PURPOSE

To compare GM diversity between female athletes by HBC use across their menstrual cycles while controlling for hormone fluctuations.

## HYPOTHESIS

The research team anticipates the null hypothesis to be true: there will be no difference between groups. The alternative hypothesis is that gut diversity will be lower in the HBC group.

## METHODS

### Participants

30 physical active females will be recruited; 15 taking HBC and 15 who are not. Birth control status must have been consistent for the past 6 months. "Physically active" is defined as consistent cardiovascular and resistance exercise training for at least six months. Participants must not have any condition affecting gastrointestinal health or hormone levels, and not have taken any antimicrobial medication within three months.

## METHODS

### Recruitment

Participants will be recruited in three phases until all spots are filled.

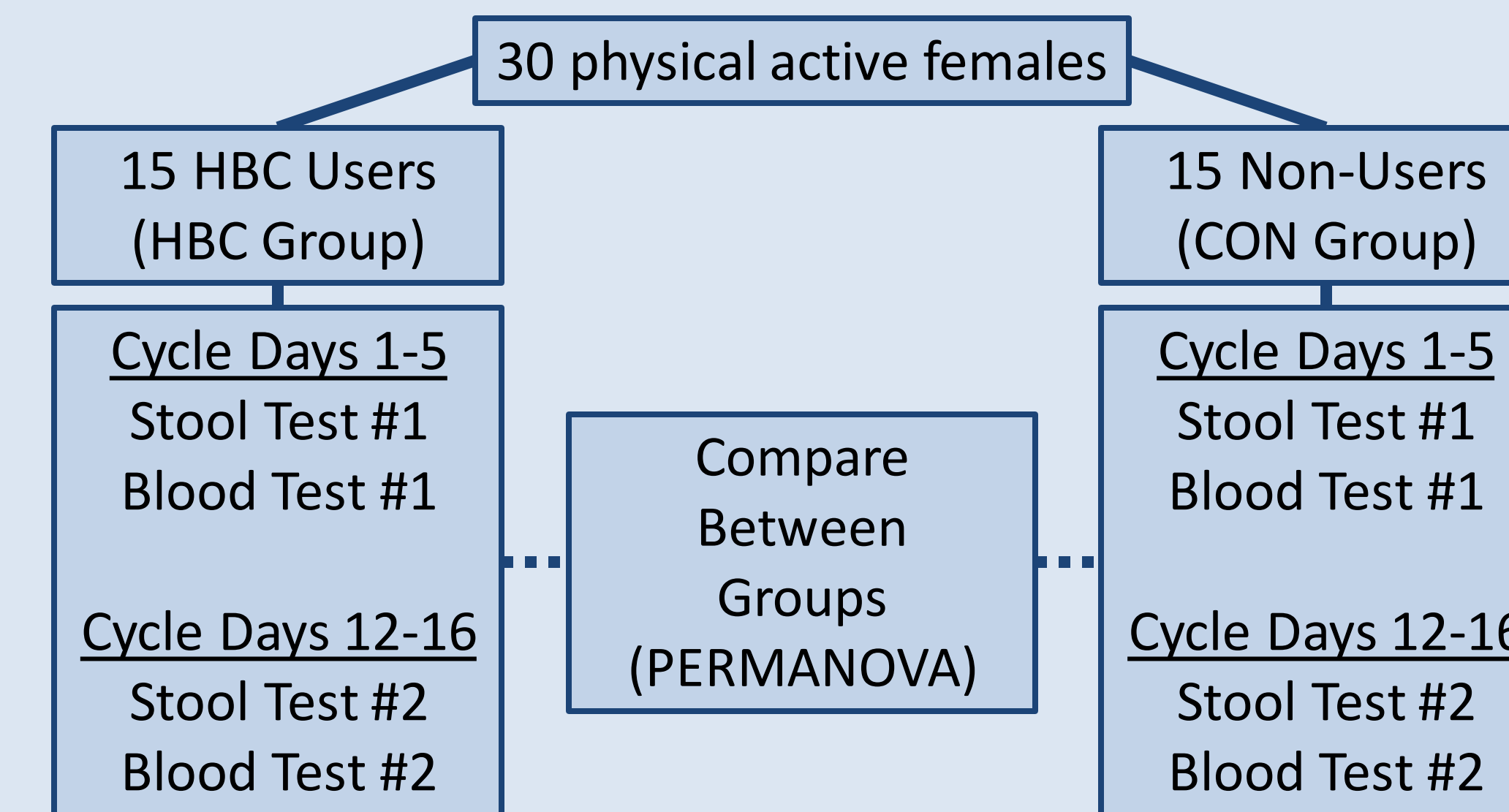
- Phase 1 – Intercollegiate Teams: Head coaches and strength & conditioning coaches will be contacted for permission to attend practice for recruitment.
- Phase 2 – Intramural Teams: Titan Link will be used to send teams an explanation of the study and how to get involved.
- Phase 3 – General Population: Instructors will be contacted for permission to attend classes and recruit physically active students.

### Procedures

Participants will meet with the research team over three visits. Additionally, participants will be asked to record their diet (using an app of their choice), water intake, and hours of sleep per night for a total of 14 days.

- Visit 1 – Initial Screening: Participants will complete consent forms, a medical history questionnaire, and have their height, weight, body mass index, and percent body fat measured via bioelectrical impedance scale. A stool collection kit will also be provided with collection instructions.
- Visit 2 – Sample Collection #1: This visit will occur on cycle days 1-5 and involve an 8-hour water fasted blood draw. Participants will independently collect their stool sample during this time window and schedule a drop off time with the research team. A second kit will then be provided.
- Visit 3 – Sample Collection #2: This visit will occur on cycle days 12-16 and follow the same process as the second visit.

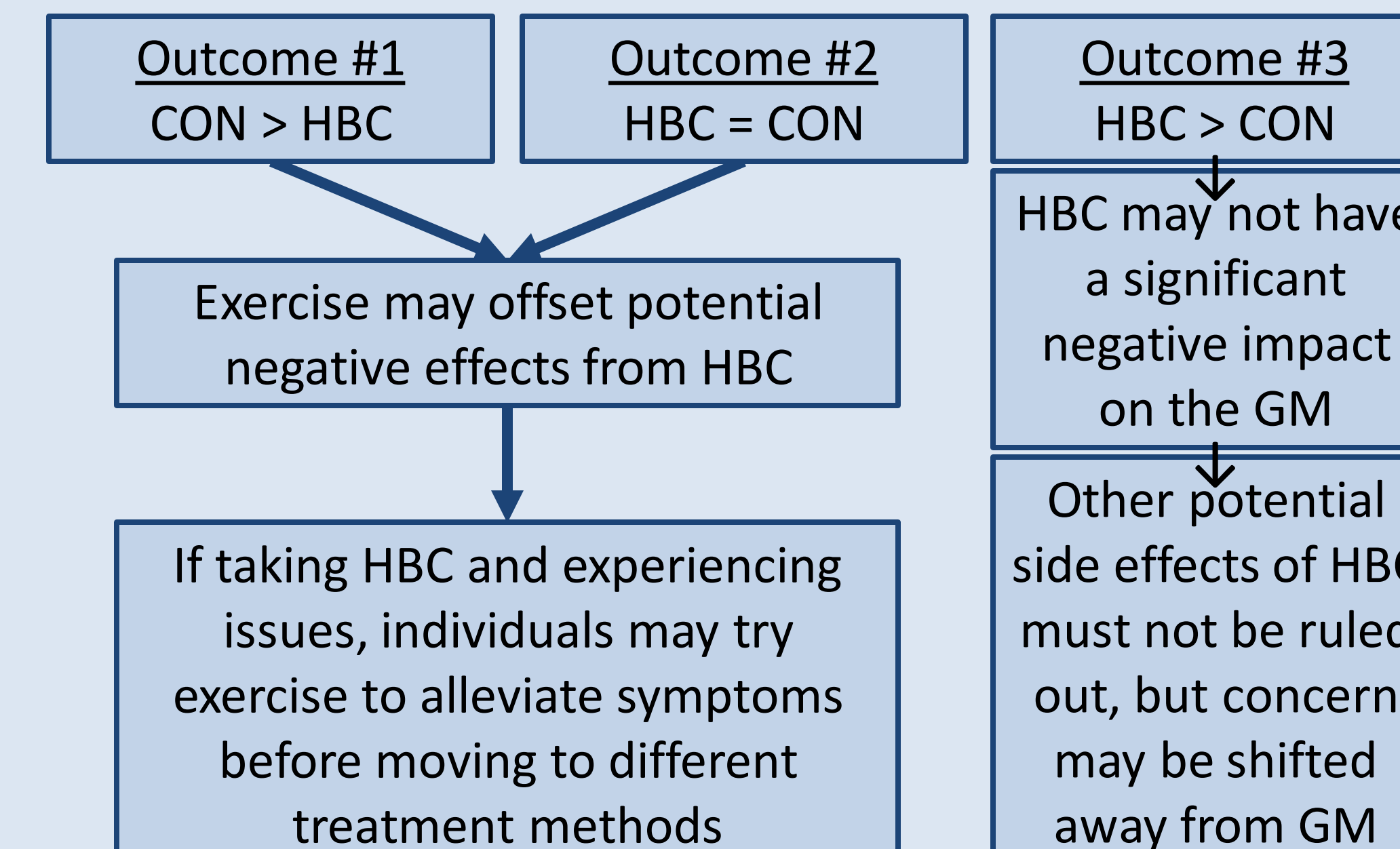
## STUDY DESIGN



## RESULTS TO DATE

	HBC Group (n=14)	CON Group (n=15)
Fully Completed	3	4
Awaiting Results	11	11

## IMPLICATIONS



## LIMITATIONS

- Not all participants tracked diets consistently (e.g., not 14 days straight, did not provide daily totals, etc.)
- Some participants began tracking water, sleep and diet on different days
- It is assumed that the bioelectrical impedance scale is calibrated
- Participants in the HBC group who are experiencing amenorrhea will be given an arbitrary cycle start
- Participant diets were unrestricted other than for probiotics
- It will be unknown if the effects of exercise override birth control or if the results are true findings
- The laboratory analyzing blood was unable to analyze all samples – the research team is currently discussing next steps

## FUTURE DIRECTIONS

It is recommended that future studies look at larger sample sizes over a longer period of time. Emphasis should be put on sport type (e.g., aerobic vs. anaerobic) to see if certain training elicits different effects. If possible, diet should be controlled for, and more frequent blood tests should be performed to accurately capture the hormone fluctuations throughout the menstrual cycle.

## REFERENCES & ACKNOWLEDGEMENTS

This work was supported by the United States Department of Agriculture – NIFA under Award No. 2021-77040-34904. <3

