A Randomized, Placebo-Controlled Pilot to Evaluate the Ability of Effera to Modulate Iron Homeostasis and Exercise Performance in Exercising Females with Compromised Iron Status

IRB #: __26-88_

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Laboratory: _Exercise and Performance Nutrition Laboratory, Lindenwood University___

Study Overview

The purpose of this study is to evaluate the impact of adding human lactoferrin to a low-dose iron supplement on iron levels, exercise performance, and lactate metabolism in active women with low ferritin levels. Iron deficiency is common, affecting up to 1 in 3 female athletes, and can lead to fatigue and reduced performance. While iron supplements can help, they can often cause stomach discomfort. Lactoferrin may offer an adjunct strategy that is gentler as it may improve the tolerability of and uptake of iron.

Participants will take either a low dose of lactoferrin (100 mg) + 5 mg iron, a higher dose of lactoferrin (300 mg) + 5 mg iron, or a placebo daily for approximately eight weeks. Lactoferrin is a naturally occurring protein found in milk and other body fluids that helps bind and transport iron in the body. This study uses a specialized form of lactoferrin designed to closely match the type naturally found in the human body. All study visits and testing are supervised by trained research staff, and participant safety is a priority throughout the study.

Participation at a Glance

- Total Study Duration: 8 Weeks
- Number of Visits: 6 Visits
- Time per Visit:
    - Visits 1, 3, and 5: 30-45 min each
    - Visits 2, 4, and 6: 120 min each
- Supplementation: participants are assigned randomly to consume one of three supplements
    - Low Lactoferrin (100 mg lactoferrin + 5 mg iron)
    - High Lactoferrin (300 mg lactoferrin + 5 mg iron)
    - Active Control (Placebo + 5 mg iron)
- Participant Pre-Visit Requirements:
    - 8-hour food and caffeine fast
    - Abstain from exercise for 12 hours
    - Abstain from tobacco, nicotine, and alcohol for 8 hours
    - Wear athletic clothing and shoes
- Compensation: $500 with Direct Deposit

How to Get Started

1. Complete the ***screening form.***
   2. Our team will review your info and contact you with eligibility.
   3. If eligible, we will schedule Visit 1 (see next section for details).
   4. Visit 1 includes: informed consent, intake paperwork (health history, study questionnaires), heart rate, blood pressure, and a single blood draw to test for ferritin levels.

Study Visit(s) Outline

	Visit 1 (Day -3 to 0)	**Visit 2** (Week 0)	**Visit 3** (Week 2)	**Visit 4** (Week 4)	**Visit 5** (Week 6)	**Visit 6** (Week 8)
Visit Length	45 mins	120 mins	30-45 mins	120 mins	30-45 mins	120 mins
Consent	✓					
Screening	✓					
Height & Body Mass	✓ All visits					
Heart Rate & Blood Pressure	✓ All visits					
Blood Sample Collection	✓ All visits					
Subjective Perceived Recovery Scale	✓ All visits					
Questionnaires: Gastrointestinal/Menstrual Symptoms, Quality of Life		✓		✓		✓
Treadmill VO2Peak Assessment		✓		✓		✓
Treadmill Exercise Performance Test		✓		✓		✓
Supplement Daily			Lactoferrin + iron OR iron only			
Daily Supplement Diary			Online/Paper log to track daily study supplement consumption			
Provide Compensation and Results						✓

Procedure Details

- **Blood Sample Collection –** A trained research team member will collect blood from a vein in the arm using standard procedures at each visit. Each blood draw takes about 5-10 minutes, and all samples are handled and stored using approved safety protocols. The first blood sample will be used to provide information on your iron/ferritin levels to inform us of whether you qualify for the study or not. Blood samples from all other visits are collected to help researchers understand how the body responds to supplementation. These samples are used to measure markers related to oxidative stress, inflammation, and iron status and iron binding capacity.
- **VO_2Peak Assessment –** This test measures aerobic fitness and how efficiently the body uses oxygen during exercise. Participants walk or run on a treadmill while wearing a mask that measures breathing, with heart rate monitored throughout. The test gradually becomes more challenging and continues until the participant chooses to stop due to fatigue. The test lasts approximately 20 minutes, including warm-up.
- **Treadmill Exercise Performance Test –** This test measures short-duration exercise performance. After the longer exercise bout, participants will complete a running "Time to Exhaustion" test. Following an easy warm-up, participants will begin running at a certain percentage of their aerobic capacity (measured with VO_2Peak assessment) for 3 minutes. The test will get harder every 3 minutes and will be completed when the participant decides they can no longer keep running at the speed set.
- **Questionnaires –** Participants will complete short questionnaires related to gastrointestinal and menstrual symptoms, overall quality of life, and feelings of recovery for your sport/exercise. These surveys help researchers understand how participants feel throughout the study. Completion time is approximately 10 minutes, depending on the visit.

Compensation & Benefits

- Total Compensation Amount: $500
- Compensation Distribution: paperwork will be completed and filed during the final research visit. It typically takes 2-4 weeks for the university and your bank account to process.
- Non-monetary Benefits:
    - Iron levels and iron panel results
    - VO_2Peak (aerobic/endurance capacity) Results
- You will receive no direct benefits for completing this study. We hope what we learn may benefit other people in the future.

Risks & Safety

- *Privacy and Confidentiality*: We are collecting data that could identify you, such as name, phone number, and email address. Every effort will be made to keep your information secure. Only research team members can see any data that may identify you.

- *Risk of Musculoskeletal Injury:* There is a risk of musculoskeletal injury and/or soreness from exercise and performance testing. All tests and exercise bouts are supervised and administered by trained personnel. Study team members will explain the test and be present to assist if any problem arises. An AED is in the building. In addition, research team members are certified in CPR/AED/First-Aid and/or certified as strength and conditioning specialists. Physical risks to intense exercise will be minimized by the health appraisal completed during screening and that all participants are already accustomed to exercise.

- *Risk of Adverse Events from Supplementation:* Although the supplement used in this study is not expected to cause adverse effects when taken as directed, there is always a possibility of an unexpected reaction. Possible risks may include mild gastrointestinal symptoms such as nausea, stomach discomfort, constipation, diarrhea, bloating, or abdominal cramping, which are occasionally associated with oral iron supplementation or general capsule consumption.

- *Risk from Blood Collection:* You will have blood sampled from your arm six times during the study. It is possible that blood collection may cause your arm to get sore and/or bruise at the collection site. Blood collection also increases the risk of getting an infection. Risk of infection will be minimized through effective disinfecting of the laboratory environment, proper phlebotomy techniques, and proper handling and disposal of all phlebotomy devices.

  The total amount of blood collected from you on study visit 1 will be about 5 mL (~1 tsp) and at study visits 2-6 will be about 20 mL (~4 tsp) each visit.

Frequently Asked Questions (FAQs)

Q: Will I receive my test results?

A: Yes. You will be provided with a summary of your results for iron status and peak aerobic and endurance capacity (VO_2Peak) at the end of your participation.

Q: Can I withdraw from the study at any time?

A: It is always your choice to participate in this study. You may withdraw at any time. You may choose not to answer any questions or perform tasks that make you uncomfortable. If you decide to withdraw, you will not receive any penalty or loss of benefits. If you would like to withdraw from a study, you can contact the research team at epnl@lindenwood.edu or (636) 949-4676; the Principal Investigator, Chad Kerksick, PhD directly at (636) 627-4629 or ckerksick@lindenwood.edu. You may also contact the laboratory coordinator, Anthony Hagele at (636) 949-4785 or ahagele@lindenwood.edu.

Q: Will my information be kept private?

A: We will do everything we can to protect your privacy. We do not intend to include information that could identify you in any publication or presentation. Any information we collect will be stored by the researcher in a secure location. The only people who will be able to see your data are: members of the research team, qualified staff of Lindenwood University, representatives of state or federal agencies.

Q: What if I miss a visit?

A: Contact the research team as soon as possible. We will attempt to reschedule within the study timeframe, when possible.

Q: Do I have to be an athlete or highly trained?

A: Yes. We are recruiting women who regularly engage in training/exercise. Some criteria are listed below, but please do not hesitate to discuss this with us if you are not sure if you qualify or not.

- Engaging in ≥5 hours per week of structured endurance exercise (e.g., running, cycling, swimming, rowing) for the past ≥6 months, with ≥3 sessions per week at moderate-to-vigorous intensity.
- Training must be consistent, with no interruptions >2 consecutive weeks in the past 6 months and performed with the purpose of improving performance or preparing for a competition or personal goal.

Q: Can I bring a friend or family member to visits?

A: Yes, you are welcome to bring a friend or family member to your visits. They will not take part in the study procedures, but they are welcome to wait in the designated areas during your appointment.

Q: What if I have dietary restrictions or allergies?

A: If you have dietary restrictions or allergies, please let the research team know. We will review them with you to ensure the study procedures and any provided products are safe and appropriate for you.

References

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2. Sim M, Garvican-Lewis LA, Cox GR, Govus A, McKay AK, Stellingwerff T, Peeling P. Iron considerations for the athlete: a narrative review. Eur J Appl Physiol. 2019 Jul;119(7):1463-1478.

3. Peterson RD, Guarneiri LL, Adams CG, Wilcox ML, Clark AJ, Rudemiller NP, Maki KC, Malinczak CA. A randomized, double-blind, controlled trial to assess the effects of lactoferrin at two doses vs. active control on immunological and safety parameters in healthy adults. Int J Toxicol 2025.44(1):12-28.

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Location

Lindenwood University
Exercise and Performance Nutrition Laboratory (EPNL)
Fieldhouse, Rm 126
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