

Ovulation Monitoring Protocol

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1 Purpose:

- a) To confirm ovulation, as menstrual bleeding alone does not confirm that ovulation has occurred. Confirmed ovulation is one of the gold standards to confirm athletes are not in a state of low energy availability (LEA).
- b) To educate athletes, coaches, and staff on the potential consequences of being in chronic LEA leading to the condition of Relative Energy Deficiency in Sports (REDs)

2 Background:

Energy availability (EA) is defined as Energy Intake (EI) – Exercise Energy Expenditure (EEE), and corrected for Fat Free Mass (FFM)¹. Chronic (weeks to months) and/or acutely severe (few days with large energy deficits) low energy availability (LEA) can lead to a constellation of adverse health and, in athletes, performance outcomes^{2,4}. This condition arises when there is insufficient EI consumed to support basal metabolic activity and EEE, resulting in LEA and leading to various physiological/psychological dysfunctions. One sign of LEA in women, reflecting the LEA mediated changes in reproductive hormone production, can be menstrual irregularities and missed ovulation. When occurring in athletes, this is termed Relative Energy Deficiency in Sport (REDs)². The health concerns associated with longstanding LEA in athletes (REDs) include gastrointestinal and cardiovascular dysfunction, hypogonadotropic hypogonadism, psychological sequela and compromised bone health. All of these consequences can contribute to an increased risk of injury & illness and impaired training adaptation; both of which may cause a decrement in sport performance²⁻⁶.

With the goal of preventing poor health & performance outcomes, confirming ovulation via the luteinizing hormone (LH) surge is one important indicator of adequate energy availability. It is important to note that regular menstrual bleeding does not always indicate ovulation and/or normal menstrual function. One study of recreationally active women (running ~30km/week) observed 12% to 20% anovulation (lack of ovulation; see definition below) despite reporting regular menstruation^{7,8}. This emphasizes the importance of monitoring ovulation, not just menstruation (i.e. bleeding), as it is the primary indication of normal endocrine function.

3 Key Definitions:

The following are key scientifically established definitions as established by Elliott-Sale and colleagues in several recently published papers^{9 10}: All definitions below are only relevant in women NOT currently taking Exogenous Hormone Contraceptives (EHC); this includes Oral Contraceptive Pills (OCP), implants, injections, intrauterine devices (IUD) /coils that are hormone releasing, vaginal rings, and contraceptive transdermal patches. This does NOT include copper-based IUDs, as they are not hormone based.

Naturally Menstruating: those who experience menstrual cycle lengths ≥ 21 days and ≤ 35 days resulting in nine or more consecutive periods per year.

Irregularly Menstruating - Long (Oligomenorrhea): those who experience fewer than nine menstrual cycles per year or menstrual cycle length that is >35 days.

Irregularly Menstruating – Short (Polymenorrhea): those who experience menstrual cycle length that is <21 days.

Not Menstruating - Primary (Primary Amenorrhea): failure to reach menarche by age 15 years when development of secondary sexual characteristics is evident, or by age 14 years when no secondary sexual characteristics are present.

Not Menstruating – Secondary (Secondary Amenorrhea): the absence of ≥ 3 consecutive periods in non-pregnant women with a history of past menses.

Anovulation: the absence of ovulation [ovulation cannot be detected by urinary LH surge or confirmed by hormone concentrations via blood sample analysis].

4 General Methods:

4.1 Goal:

To monitor for ovulation, as indicated by the LH surge, using urinary ovulation detection kits typically over a window of 3 or more months to identify if an athlete is experiencing anovulatory cycles and thus who may be at risk of being in a state of LEA and experiencing consequences of REDs.

4.2 Participant Inclusion criteria:

4.2.1 Naturally Menstruating, Irregularly Menstruating – Long and Short (*Oligomenorrheic* or *Polymenorrheic*) athletes.

4.3 Participant Exclusion criteria:

4.3.1 Use of medications that would affect the hypothalamic–pituitary–ovarian (HPO) axis¹¹

4.3.1.1 Any exogenous hormone therapy, including EHC for the past six months.

- NOTE: Copper IUDs are acceptable.

- Examples: any exogenous hormones; hormone contraception, estrogen, progesterone and testosterone.
- 4.3.2 Illness or disease that causes disruptions to the eumenorrheic menstrual cycle (e.g., polycystic ovary syndrome, endometriosis, thyroid disorder or hyperlactatemia) or other clinical conditions associated with hypothalamic pituitary axis disruptions.⁷
- 4.3.3 Known amenorrhea (Please see section 5 below).
- 4.3.4 Pregnancy.
- 4.3.5 Menopause⁹

4.4 Tools:

- 4.4.1 Urinary ovulation detection kits – sourced online or at pharmacies
- Examples include Easy@Home Ovulation Test Strips, First Response Ovulation Test and Clearblue Advanced Digital Ovulation Test.
 - Note that these kits are often much cheaper to buy in bulk online.
 - Typically, it takes approximately 20-40 ovulation strips to confirm ovulation status over a timeframe of 3 months. It may be more or less, depending on ovulatory patterns.
- 4.4.2 Calendar to track menstrual cycle, and when ovulation occurs.

4.5 Intervention:

This section will highlight the General Principles (4.5.1) and the Protocol (4.5.2) for ovulation monitoring for the following scenarios: Naturally Menstruating, Irregularly Menstruating – Long and Short (*Oligomenorrheic* or *Polymenorrheic*)

4.5.1 General Principles of ovulation monitoring

As part of the protocol (4.5.2), the athlete is to follow general principles of ovulation monitoring:

- a) Documentation of the start of the menstrual cycle using a calendar, if menstruating.
- b) Conduction of the test and interpretation of the test result according to the testing kit instructions.
- c) Measurement of ovulation using the ovulation strips first thing in the morning upon waking to capture the LH surge that precedes ovulation (as LH surge generally occurs in the 12pm to 8:00am window^{12, 13}).
- d) If ovulation occurs, documentation of the date and time of ovulation using a calendar.
- e) Follow the protocol outlined here. In the event the athlete is faced with a discrepancy in information/recommendations (such as in blogs, or ovulation tracking apps), it is advised they consult with their physician.

4.5.2 Ovulation Monitoring Protocol

The athlete is to adhere to the following protocol for ovulation monitoring:

Protocol:

- a. Testing begins 7 days after Day 1 of a new menstrual cycle using the ovulation strips. Day 1 of the athlete's cycle is the first day of menstrual bleeding and is recorded in a calendar as 'M1' (or 1st Menstrual Cycle). If the menstrual cycle is not consistent, begin testing right away.
- b. Testing is conducted daily until a positive test is shown. A positive test represents the LH surge that confirms ovulation. A positive test is recorded in a calendar as 'O1' (or 1st Ovulation Cycle).
 - i. Note: the start of the LH surge precedes ovulation by 24-48hrs.
- c. For the next two cycles, document the date of each cycle in a calendar as 'M2' or 'M3' (or 2nd or 3rd Menstrual cycle). Testing begins using the ovulation strips 7 days prior to the expected Ovulation Day, based on when ovulation occurred during the previous menstrual cycle (reference 'Ovulation Day 1').
- d. Testing is conducted daily until a positive test is shown, and is to be recorded in a calendar as 'O2' or 'O3' (or '2nd Ovulation Cycle' or '3rd Ovulation Cycle'), as applicable.
 - i. If ovulation does not occur monthly during this 3 month monitoring window, this suggests that ovulation is not occurring every month. This would indicate that the athlete may be in a state of LEA and thus at risk of the physiological changes that result from REDs. Immediate follow-up with a physician is recommended in this scenario.
- e. A photo of the positive ovulation test is to be shared with the athlete's physician as confirmation of ovulation. The photo should include the name of the athlete and the date of the ovulation result. This information can be recorded on the tip of the ovulation stick if room permits.
- f. Initial ovulation monitoring should be conducted for a minimum of 3 months, and then repeated throughout the year depending on ovulation test results and recommendations from the athlete's physician.

5 Not Menstruating (Primary or Secondary Amenorrhea)

If the athlete experiences primary or secondary amenorrhea, it is highly possible that they are in prolonged and significant state of LEA and REDs (or other clinical dysfunction/diagnosis). A follow-up with a physician for immediate review is advisable. As other conditions can lead to amenorrhea, the athlete and physician should discuss what further investigations may be appropriate.

If the athlete is diagnosed with REDs, then the following is recommended to achieve optimal EA and a return to ovulation:

- Increased energy intake immediately. We do recommend that the athlete works with a Sport Dietitian to work to address the shortfall in energy availability.
- Consider a reduction in training load to decrease energy expenditure.

6 References:

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