

Under-Fueling in Athletes and Active People

*Helping you live
well to learn well*

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Under-fueling in athletes and active individuals may lead to **Relative Energy Deficiency in Sport (REDs)**.

What is REDs?

REDs describes a syndrome of poor health and declining athletic performance that results from a mismatch between energy intake from food and energy needs.

REDs is a consequence of chronic **Low Energy Availability (LEA)**, which occurs when energy intake is insufficient to meet the energy required to fuel daily activities and training.

Adequate and consistent fueling strategies are key to avoid the negative performance and health consequences of untreated LEA and REDs. It's important to have enough energy ready and available to support your body's health, daily activity, academics, growth, and training. Recovery from exercise and healing from injuries also require additional energy and nutrients.

Potential symptoms of LEA & REDs

- Fatigue – feeling tired often
- Not seeing progress in training
- Unable to maintain or increase lean muscle mass
- Injury
- Illness
- Low mood / irritability / depression
- Unable to focus and concentrate
- Low iron
- Changes in reproductive function/hormones
- Irregular or absent menstrual cycles
- Lowered sex drive
- Gastrointestinal upset / bloating
- Hair loss
- Trouble staying warm

How to avoid LEA & REDs

Your body uses energy 24 hours a day. Fuel for the work required!

- Eat 3 meals (or more) a day, plus snacks. Include pre-exercise fueling and post-exercise recovery nutrition
- During heavy training, you may need to eat beyond your level of hunger. Include energy-dense foods like nuts, nut butters, dried fruit, cheese, granola, trail mix, juice, milk/ chocolate milk, and protein shakes.

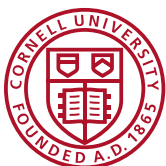


Under-fueling can negatively impact your cardiovascular, bone, metabolic, immunological, gastrointestinal, reproductive, and psychological health, and limit your athletic performance.

Benefits of adequate fueling

- ✓ **Energy to train harder = performance gains!**
- ✓ **Consistency of performance and longevity – performing well in the long-term**
- ✓ **Muscle/lean body mass gains**
- ✓ **Increased energy for focus in athletics and academic**

- Eat adequate carbohydrates. About half of your plate should come from starches (i.e. rice, pasta/noodles, bread, potatoes, beans, cereals/oats, and other grains).
- Balance your plate by including protein and fat sources at each meal.
- Remember to include “fun foods” or treats.
- Seek medical and nutrition advice through a Sports Dietitian or other health care provider.



Fueling tips

Refined or simple carbs provide easily available energy to fuel your exercise.

Pre-exercise fueling ideas:

- Protein, granola, or fig bar (such as a Clif bar, Nutrigrain bar, or Fig Newton)
- Sports chews or gels
- Toast or toaster waffles
- Crackers (including goldfish crackers and animal crackers)
- Pretzels
- Pita chips
- Fruit (fresh, dried, frozen, canned)
- Fruit snacks or applesauce pouches
- Bagel / mini bagel or English muffin

Recovery fueling ideas for soon after training:

After hard training, consume protein and carb sources to help replenish your energy stores and provide nutrients to repair and build muscle. Aim to have a recovery snack and/or a complete meal within about 30 to 60 minutes after your training!

- Chocolate milk or chocolate soy milk, a protein shake, or smoothie
- Greek yogurt or cottage cheese and fruit
- Protein bar (such as Clif Builder Bar or Gatorade Whey Protein Bar)
- Tart cherry juice with protein added (for example, Cheribundi protein drink)
- Sandwich with meat, hummus, or nut butter (for example, peanut butter and jelly sandwich)
- Cheese or cheese sticks with pretzels, pita chips, or fruit
- Glass of soy milk with vanilla wafers, gingersnaps, or animal crackers
- ... and/or have a complete meal within about 30 to 60 minutes after your training!

Consequences associated with under-fueling

Health effects:

- Hormonal alterations (such as irregular or skipped periods and lowered testosterone production)
- Loss of bone density with increased risk of stress fractures and early onset osteoporosis
- Suppressed metabolic rate and increased body fat storage
- Decreased ability to gain muscle mass
- Limited ability to obtain normal growth and development
- Risk of nutritional deficiencies
- Increased cardiovascular risk due to low heart rate, causing dizziness and the potential for long-term heart damage

- Increases in moodiness, anxiety, or depression
- Decreased immune function/increased risk of illness and infections

Performance effects:

- Decreased endurance
- Decreased muscular strength
- Decreased glycogen (energy) stores
- Increased injury risk
- Increased irritability
- Lowered training response
- Lowered coordination
- Decreased concentration
- Decreased judgement

Resources

- Cornell Health's Collaborative Health & Eating Program (CHEP): health.cornell.edu/chep
- American Sports and Performance Dietitians Association: sportsrd.org
- The United States Olympic & Paralympic Committee's sport nutrition information: usopc.org/nutrition
- Project RED-S: red-s.com
- Eating disorders screening tool: nationaleatingdisorders.org/screening-tool

How to get support

Schedule an appointment with a Cornell Health nutritionist: call 607-255-5155 or visit health.cornell.edu/appointments.

NCAA athletes may also reach out to their team's sports nutritionist or athletic trainer.