

How the Body Uses Fuel for Energy

ATP: Adenosine triphosphate. A compound found in muscle and the liver and is required for muscle contraction. Allows for short, intense effort but gets used up almost immediately (in about 90 seconds) as the work of the muscle increases. It must be replaced in order for the muscle to keep moving.

Glycogen: Reserves of carbohydrate stored in muscles and in the liver.

Can't ride without ATP! Your body always has to make more.

Anaerobic system (without oxygen)

Glycogen/Lactic Acid System makes ATP.

A cell breaks down glycogen into glucose then uses anaerobic metabolism to make the ATP and Lactic Acid, a byproduct. It produces enough ATP to last about 90 seconds. The lactic acid can build up and interfere with the ability to turn fuel into energy causing muscle fatigue and soreness. This is known as the Anaerobic Threshold.

Aerobic system (with oxygen)

Complete breakdown of carbohydrate (glucose) into carbon dioxide and water. No lactic acid. The carbohydrate used comes from glycogen in muscle and the liver and from food and fluids.

Slowest way the body makes ATP but it can continue to supply ATP for several hours or longer, as long as the fuel supply lasts.

Aerobic system uses:

1. carbohydrates first
2. then fats
3. finally proteins, if necessary

If you don't consistently replenish carbohydrates you *will* bonk.

Bonk: Suddenly losing energy and becoming fatigued, the result of glycogen stores in the liver and muscles becoming depleted. Very difficult to recover from. Body begins to burn fat which is a much less (3X) efficient fuel than carbs.

How to Get Energy to Your Muscles

Food: Keep Your Tank Filled

Before a Ride: Protein + Carbs + Fat

Eating carbs before cycling helps preserve muscle and liver glycogen and reduces the risk of bonking.

Week before:

Eat protein/carbohydrate/fat at most meals. No real need to carbo-load.

Day before:

Add some complex carbs to your meals throughout the day.

- Veggies, whole grains, pasta, potatoes, fruit.

Morning of:

- Eating 2 hours before: 1-2g carb/lb body wt. Eat a meal with protein/complex carbs/fat. Eggs/toast/potato, cereal/milk/fruit.

- Eating 1 hour before: 0.5-1g carb/lb body wt. Tops off your glycogen stores and enhances stamina and energy/easily digestible. Energy bar, sports drink, fruit.

- Eating <30 minutes before: 0.25-.5g carb/lb body wt. Simple carbs for quick energy. Should be easily digestible. Sports drink, fruit.

Pre-exercise volume of food/digestion time:

- large meal = 3-4 hours
- smaller meal = 2-3 hours
- liquid meal = 1-2 hours
- small snack = less than an hour

During a Ride: Carbs

- Short ride <90 minutes: Water or sports drink

- Long and/or Intense Ride: Constant replenishment of carbs: 30-60g/hr; 100-250 calories/hr.

Eat small amounts, frequently.

Fig Newtons, banana, PB & J sandwich, pretzels, trail mix, energy gels, energy bars (ClifBar), Larabar, Payday bar, ShotBlocs, jelly beans, baked potato, etc.

If fading, eat/drink sugary carbs ASAP!

- Lunch:

Have some protein, carb, and fat. Don't overeat.

After a Ride: Carbs + Protein

The goal is to return your body to pre-exercise levels of glycogen storage, help heal damaged muscles, rehydrate body tissue, and replace electrolytes to prevent fatigue and prepare your body for the next ride.

Immediately after:

- Eat within 30 to 60 minutes immediately after riding (known as the **Glycogen Window**) when glycogen-depleted muscles readily absorb all available glucose. Replenish with 0.75g carb/lb body wt.
- Eat Carbs: Anything you've eaten on the bike, a sandwich, a sports drink, fruit, etc.
- A 4:1 carb to protein (which has BCAA-branched chain amino acids) is optimal because eating a little protein with carbs helps heal damaged muscle tissue: chocolate milk, whey protein shake with fruit, or a sports recovery drink.

1 + hours after:

- Keep eating carbs + protein + fat for several hours after a long ride. Basically have a normal meal within the next few hours. Don't overeat or you'll just gain weight and it will be harder to get up hills!

Fuel usage at different exercise intensities

Low intensity (20-25% of maximal effort)

- burns highest % fat (aerobic).
- won't really improve fitness much.
- long/not very intense workouts will burn a balanced mix of fuels for most of the workout.

Moderate intensity (40-50% of maximal effort)

- 50/50 mixture carb and fat is burned (mostly aerobic).
- % of energy produced from fat decreases but the absolute amount of fat burned increases.

High intensity (50-85% of maximal effort)

- burns mostly carbs, not fat because you need oxygen to burn fat (mostly anaerobic).

Fluids: Hydrate and Rehydrate

Fluids help you avoid dehydration and can supply carbs for energy.

The body is ~ 60% water; 45% stored in muscles. The best way to prevent dehydration during exercise is to make sure you are well hydrated before you begin.

Before a Ride:

- Drink fluids (mostly water) all week long: Urine should be clear.
- Drink 1-2 glasses at least 1 hour before.

During a Ride:

- Short ride <90 minutes:
Only need water or sports drink.
- Long and/or Intense Ride:
Liquid carbs: gels or sports drinks to replace minerals (sodium, potassium, calcium) lost through sweat, evaporation, and urine. Sip every 10-15 minutes. Average 1 bottle/hr.
- Adjust fluid intake based on weather conditions. When exercising hard and in hot weather drink up to 2 bottles per hour. When exercising in cold weather remember to drink! Dehydration is still possible in cold weather.

After a Ride:

- Rehydrate body tissues:
Drink enough fluid to quench thirst, then drink some more.
- Avoid alcohol.