Carbologist Athlete Connor T1D 17 Years: Carbs and Exercise

Pertaining to carbohydrate intake before, during, and after workouts, the National Health Institute recommends consuming small portions of fast acting carbohydrates before physical activity, and, as needed, the replenishment of carbohydrates during and after exercise. Generally speaking, this is good advice, even if you go a little high. As a surgeon once told me, "better a little sweet than sour." However, over my years of experience narrowing down my fluctuations, I have written general guidelines that have seen fewer lows and highs. For context, I am a weightlifter, rock climber, and short-distance runner with a focus on short bursts of high exertion and an emphasis on prolonged activity. In essence, I train to have strength, but also to use that strength for longer periods; it gives me the best of both worlds in power and endurance. So, keep in mind, this may look different for those on opposite ends of the strength/endurance spectrum: power lifters and long-distance runners.

1. Avoid insulin injections prior to and during exercise. Ever had a stubborn high that you wish would go down? So, what do you do? Well, if you're anything like me when you get frustrated, you'll inject insulin, then go for a run. This is a recipe for disaster. When we exercise, our insulin receptors open up, and any resistance we had plummets. Generally speaking, with insulin having a peak onset period of approximately 1-2 hours (if using Humalog like me), try holding off on exercise for about an hour and a half after injecting.
2. Avoid large meals before exercise. This is a similar rule to #1, but with food involved. Even if you get your calculation right on target to compensate for carbs, your body's receptivity to insulin may far outpace your body's ability to absorb sugar into the blood, resulting in dangerous lows.
3. Be proactive about lows and highs during exercise, but don't micromanage or overdo it, and be patient. If you're like me and wear a Dexcom (or any other constant glucose monitor for that matter), keep a close eye on trends. If you're trending down, take the recommended amount of glucose for correction. If you're trending up, you may think about taking a reduced dose of insulin to compensate. During heavy exercise, I have seen my insulin requirements drop down to as low as 30% of my correction dose. The key here is, be careful, and most importantly, be *patient*. Sugars don't change right away. Wait 15-20 after carb intake, and up to an hour to see the results of an insulin injection.
4. Be cautious with both carb replenishment and insulin injections after exercise. In my experience, I have seen very low insulin resistance and very high carb receptivity post-activity. As most of us try to ingest protein after a workout, be cognizant that protein can spike your blood sugar much more than you may realize. A good rule of thumb is, glucose brings blood sugar up, but protein keeps it there.
5. ***For Non-Diabetic Athletes***: PubMed recommends a high carb-loading factor for non-diabetic athletes at approximately 4.5 to 5.5 grams of carbs per pound of body weight for 36-48 hours before high intensity exercise (e.g. a competition). Science Direct recommends .4 to .5 grams of carbs per pound within the first 4 hours post-exercise, and for sustained activities exceeding 60 minutes, 30-60 grams per hour is recommended.

The following is a quick reference chart that covers what is outlined above. My workouts usually last around an hour. For longer workouts, extend the "during" portion and follow guidelines as needed. Keep in mind, regular blood sugar check are much easier with a CGM device that pairs to your phone.

	1-2 hrs pre	**15 min pre**	**15-30-15 min during**	**15 min post**	**1-2 hrs post**
Carbs	Cease consumption of carbohydrates	Check blood sugar. If low, correct with small amounts of fast-acting carbs. My go-to is anywhere from 4-8 grams.	Check blood sugar. If trending low, take 4 grams, and wait 15-20 minutes.	Check blood sugar, inject a reduced dose for a meal, wait 15 minutes, and ingest food.	Check blood sugar, ingest correction glucose as required/recommended by your physician.
Insulin	Avoid injections	Check blood sugar. If high, either avoid dosing entirely, or simply take a reduced dose. I have seen success with ¼ to ½ a dose prior to exercise.	Check blood sugar. If high, but not out of range, consider avoiding insulin. If rising consistently beyond range, consider a ¼ to ½ correction dose. Wait up to an hour to see results, and do not micromanage with further doses.	Same as above.	Check blood sugar, inject an insulin dose, keeping in mind you may need to reduce how much is taken due to heightened insulin sensitivity.
Notes	*Goal: establish a flat blood sugar trend. Let any residual carbs and insulin in your system play out.*	*Goal: correct any unwanted downward/upward trends liberally.*	*Goal: maintain a flat trend.*	*Goal: replenish the body with nutrients/carbs/protein while maintaining as flat a trend as possible.*	*Goal: correct for any lows or highs.*

Addendum:

1. The carbs you want to use for carb loading 36-48 hours prior to intense exercise, in my experience, are complex carbs. Good examples are sweet potato, broccoli, or multigrain pastas or breads. This would be low to medium glycemic index foods. This timeframe would be a good one use a slow-acting carb product. The idea is that the body is building up carbohydrate stores in preparation for a high-intensity workout within approximately 48 hours.

2. If during exercise, good fast-acting carbs, in my experience, are simple glucose tablets. These are ideal because they are measurable in small doses of 4g per tablet. Another good option is carb gel. If shorter than 60 minutes, the American Heart Association states that carb replenishment during workouts is not necessary.

3. Post-exercise. For diabetics, I would suggest a slow-acting carb to reduce the chances of spikes, so, vegetables and complex multi-grains (low glycemic index foods). For non-diabetics, the NIH does suggest using fast-acting carbs to replenish glycogen stores in the body. Good

examples are fruit juice, sports drinks, rice, honey, etc. This would be medium to high glycemic index foods.

4. Here is a list of references that I have used in the materials for this write-up.

- https://diabetes.org/food-nutrition/eating-healthy/why-drink-more-water
- https://pmc.ncbi.nlm.nih.gov/articles/PMC6950062/
- https://my.clevelandclinic.org/health/drugs/13902-injectable-insulin-medications
- https://www.heart.org/en/healthy-living/healthy-eating/eat-smart/nutrition-basics/food-as-fuel-before-during-and-after-workouts#:~:text=You%20don't%20need%20to,yogurt%2C%20raisins%20or%20a%20banana.
- https://pmc.ncbi.nlm.nih.gov/articles/PMC5794245/#:~:text=SLOWLY%20ABSORBED%20VERSUS%20RAPIDLY%20ABSORBED%20CARBOHYDRATES&text=In%20the%20hours%20immediately%20post,total%20amount%20of%20carbohydrate%20ingested.