Exercise and Ex-Carbs

Impact of exercise intensity, duration, and training on blood glucose:

- Longer activities are more likely to cause blood glucose to decrease.
- Anaerobic exercise or short, high intensity exercise will often raise blood glucose.
- The longer and more strenuous an activity, the more you need to lower your basal and bolus dose to prevent a low.
- Untrained individuals may require more carbohydrates and/or a greater reduction in insulin doses when performing the same activity as trained individuals.

What are Ex-Carbs?

Exercise carbohydrates, or "Ex-Carbs" are a measurement of how many carbohydrates an exercise is likely to require to keep blood glucose from dropping. It considers the weight of the individual, the activity, intensity and duration. Understanding ex-carbs will allow you to determine if you need to eat more carbohydrate or reduce insulin or both when you exercise. It can also help you determine how much exercise is needed to lower a high blood sugar. Refer to the Ex-Carbs table for how many carbs you need each hour keeping in mind this is usually the maximum amount needed. Often less is needed if you are already trained for the activity or have reduced your insulin doses appropriately.

How do I use Ex-Carbs?

Eating extra carbs is the best way to handle short, less intense exercise. A reduction in insulin dose is required for longer and more intense activity. Use the following formula to determine how many units to reduce your basal or bolus dose by:

ExCarbs ÷ Carb Ratio = reduction of insulin units required to prevent a low

Most individuals will choose to lower their insulin dose in addition to consuming some replacement carbs. The difficulty in this is finding a balance between lowering your insulin dose and consuming Ex-Carbs, especially when dealing with high blood glucose prior to exercise.

ExCarbs: Grams of Carb per Hour of Activity (assuming normal starting BG)

Activity	*Intensity*	*Weight = 100 lbs*	*Weight = 150 lbs*	*Weight = 200 lbs*
Baseball		25	38	50
Basketball	moderate	35	48	61
vigorous		59	88	117
Bicycling	6 mph	20	27	34
10 mph		35	48	61
14 mph		60	83	105
18 mph		95	130	165
20 mph		122	168	214
Dancing	moderate	17	25	33
vigorous		28	43	57
Golf (pull cart)		23	35	46
Handball		59	88	117
Jump rope (80/min)		73	109	145
Mountain Climbing		60	90	120
Running	5 mph	45	68	90
8 mph		96	145	190
10 mph		126	189	152
Skating	moderate	25	34	43
vigorous		67	92	117
Skiing	cross-country	76	105	133
downhill		52	72	92
water		42	58	74
Soccer		45	67	89
Swimming	Slow crawl	41	56	71
Fast crawl		69	95	121
Tennis	moderate	23	34	45
vigorous		59	88	117
Volleyball	moderate	23	34	45
vigorous		59	88	117
Walking	3 mph	15	22	29
4.5 mph		30	45	59

Modified from Walsh, J., Roberts, R. (2012). *Pumping Insulin.* 5th ed. San Diego: Torrey Pines Press. Pg 245.

Example

John weighs 200 lbs. His carb ratio is 1u/10g and he has a correction factor of one unit for every 2 mmol/L above his target blood glucose of 6 mmol/L. John has a blood glucose of 10 mmol/L and is about to consume his lunch which contains 80 g of carb. He is planning to ride his bike at 10 mph for an hour after he eats lunch.

a) If John is only planning on adjusting his insulin dose (instead of consuming extra carbs) what amount of insulin does he need to take considering his meal, activity, and current blood glucose?

   From the chart, Ex-Carbs = 61g divided by carb ratio of 10g equals 6.1 units
   Without exercise: 80g/10g = 8 units plus 2 units for correction (10 - 6 = 4/2 = 2) or 10 units
   With exercise: 10u – 6.1 units = **3.9 units**

b) If John is planning on only consuming carbohydrates (no adjusting of insulin), how many grams of carb should he consume and how much insulin would he take before his meal?

   For meal, takes 8 units of insulin
   For correction, convert correction dose to carbs: 2 units equal 20g carbs (carb ratio if 1u/10g) so John's correction dose would account for 20 grams of carb
   From the chart, Ex-Carbs = 61g
   61g -20g = 41g

c) Instead John wants to lower his insulin dose but he also wants to consume a bottle of Gatorade (38g of carb) throughout his workout to keep him hydrated. How many units will he take now?

   Gatorade 38g would be counted as ExCarbs
   61 g of ExCarb – 38 g = 23 g of remaining ExCarb
   23 g of carb divided by carb ratio of 10g = 2.3 units
   10 u total – 2.3 u = **7.7 units**

d) John has changed his mind and wants to ride his bike in the morning before lunch. Because he hasn't eaten anything since breakfast, he plans to have a banana (about 23 g of carb) before his ride. How would this affect how John adjusts his insulin dose?

   It is too late to adjust insulin for breakfast bolus (>90 min) so must adjust basal =/- add food
   61 g of ExCarb – 23 g from banana = 38 g of remaining ExCarb
   38g/10g = **3.8 units** needs to be subtracted from morning basal insulin.

   If his basal rate is 1.0 u/hr, he could suspend his pump for 4 hours starting 1.5-2 hours prior to exercise (1.0 u/hr x 4 hrs = 4.0 units). If his basal rate is less than 1.0u/hr, he would have to eat more than just a banana to prevent a low.