## 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:

$$
\text { ExCarbs } \div \text { Carb Ratio }=\text { reduction of insulin units required to prevent a low }
$$

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 | $\begin{gathered} \text { Weight }=100 \\ \text { lbs } \end{gathered}$ | $\begin{gathered} \text { Weight }=150 \\ \text { lbs } \end{gathered}$ | $\begin{gathered} \text { Weight }=200 \\ \mathrm{lbs} \end{gathered}$ |
| :---: | :---: | :---: | :---: | :---: |
| 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 |
| $\begin{gathered} \text { Jump rope } \\ (80 / \mathrm{min}) \\ \hline \end{gathered}$ |  | 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. 5 ${ }^{\text {th }}$ ed. San Diego: Torrey Pines Press. Pg 245.

## Example

John weighs 200 lbs . His carb ratio is $1 \mathrm{u} / 10 \mathrm{~g}$ and he has a correction factor of one unit for every $2 \mathrm{mmol} / \mathrm{L}$ above his target blood glucose of $6 \mathrm{mmol} / \mathrm{L}$. John has a blood glucose of $10 \mathrm{mmol} / \mathrm{L}$ 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 $=61 \mathrm{~g}$ divided by carb ratio of 10 g equals 6.1 units
Without exercise: $80 \mathrm{~g} / 10 \mathrm{~g}=8$ units plus 2 units for correction (10-6=4/2=2) or 10 units
With exercise: $10 u-6.1$ 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 20 g carbs (carb ratio if $1 \mathrm{u} / 10 \mathrm{~g}$ ) so John's correction dose would account for 20 grams of carb
From the chart, Ex-Carbs $=61 \mathrm{~g}$
$61 \mathrm{~g}-20 \mathrm{~g}=41 \mathrm{~g}$
c) Instead John wants to lower his insulin dose but he also wants to consume a bottle of Gatorade ( 38 g of carb) throughout his workout to keep him hydrated. How many units will he take now?

Gatorade 38 g would be counted as ExCarbs
61 g of ExCarb $-38 \mathrm{~g}=23 \mathrm{~g}$ of remaining ExCarb
23 g of carb divided by carb ratio of $10 \mathrm{~g}=2.3$ 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 ( $>90 \mathrm{~min}$ ) so must adjust basal $=/$ - add food 61 g of ExCarb -23 g from banana $=38 \mathrm{~g}$ of remaining ExCarb $38 \mathrm{~g} / 10 \mathrm{~g}=3.8$ units needs to be subtracted from morning basal insulin.

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

