Carbohydrate & Insulin Adjustments

Common challenges of being active with diabetes

- Too little carbohydrate or too much insulin → low glucose (**hypoglycemia**)
- Too much carbohydrate or not enough insulin → high glucose (**hyperglycemia**)

Here are 4 strategies to manage glucose with physical activity

1. Modify carbohydrate intake before/during/after activity
2. Modify your meal-time bolus insulin
3. Set a temporary basal rate (if using an insulin pump)
4. Consider the type of activity

1. <u>Modify Carbohydrate Intake Before/During/After Activity</u>
   - If you are adjusting carbohydrate intake only, aim to eat **1g of carb per kg per hour**. It is best to spread this over the course of the activity.
   - Before or during activity, choose high glycemic index foods.
   - If you have insulin on board or glucose is trending low, have a carbohydrate snack prior to activity without insulin.

2. <u>Modify Your Meal-Time Bolus Insulin</u>
   - This is a good strategy to use if you plan to be active **within** 2 hours of a meal.
   - Reducing meal-time insulin before activity can prevent low glucose. Try reducing by 25% for light activity, 50% for moderate activity, and 75% for high intensity activity.
   - Reducing meal-time insulin following activity by 25-50% can prevent low glucose afterwards.
   - Use caution when giving correction doses of insulin following activity. Consider reducing the correction dose by 50%.

3. <u>Set a Temporary Basal Rate (If you use an Insulin Pump)</u>
   - This is a good strategy to use if you plan to be active **more than** 2 hours after a meal.
   - For moderate to intense activity, start by reducing basal rate by 30-50% 1 hour before the start of activity until 2 hours after the activity.
   - Note: If you take both mealtime and basal insulin and will be physically active for long durations, try reducing your daily basal insulin by 20% in addition to reducing your mealtime bolus before activity.

4. <u>Consider the Type of Activity</u>
   - **Aerobic activity or 'cardio'** tends to lower glucose (ex: walking, jogging, bicycling). Risk of low glucose is higher for 24 hours following activity.
   - **Anaerobic or 'resistance' activity** tends to raise glucose (ex: weight training, resistance bands, sprinting, high intensity interval training).
   - **Competitive activities and team sports**: Practice/trainings days tend to lower glucose, while competition days tend to raise glucose. You might find that you need less of an insulin reduction on competition days.
   - Tips to prevent low glucose
     - Performing resistance activity immediately before aerobic activity rather than performing aerobic activity alone or followed by resistance activity.
     - Perform brief (10 seconds), intermittent, maximal-intensity sprints either at the beginning, end or throughout a moderate-intensity activity session.

How Often Should I Check My Glucose When Active?

Activity can interfere with your ability to sense high or low glucose levels. It is recommended to check your glucose:

- 30 and 60 minutes before activity to determine direction of change
- Every 30 minutes during activity
- Within 30 minutes after the activity
- Before bed

Do Not Perform Physical Activity If

- You have had a severe low (<2.8mmol/L) within the last 24 hours
- Glucose is <4mmol/L; treat with quick sugar
- Glucose is >14.0mmol/L with ketones or >16.7mmol/L
  - Type 2 diabetes: Ensure proper hydration, monitor for signs and symptoms of dehydration.
  - Type 1 diabetes: Check for ketones. If ketones are 0.6mmol/L or greater, postpone activity and take a correction dose of insulin.

Putting It All Together

Many people find that a combination of these 4 strategies work best. The table below provides some ideas for combining methods.

	Anaerobic/ resistance activity	**Aerobic/ cardio activity**	**Mixed activity**
1-2 hrs before	Correction bolus: Consider if BG is trending high (ex: >9.0mmol/L Temp basal: May not be needed	Correction bolus: Not needed unless glucose is high (>14.0mmol/L with ketones or >16.7mmol/L) Food bolus: ↓ by 25-75% Temp basal: ↓ rate by 25-50%	Correction bolus: Not needed unless glucose is high (>14.0mmol/L with ketones or >16.7mmol/L) Temp basal: ↓ rate by 25-50%
15-30 min before	Glucose <5.0mmol/L: Have 15g carb	Glucose <8.0mmol/L: Have 15g carb	
During	If activity is >30 minutes: Have 15-30g carbs per hour of activity	Have 0.5g carb/min of activity (ex: 15g carbs for 30 min of activity)	
After	Have a snack or meal that includes carb & protein Food bolus: usual dose Correction dose: ↓ by 25-50% Resume normal basal rates unless glucose <4mmol/L	Have a snack or meal that includes carb & protein Correction and/or Food bolus: ↓by 25%-50	

Adapted from: Riddell, Michael. Getting Pumped! An Insulin Pump Guide for Active Individuals with Type 1 Diabetes. Glue Inc. 2016

Other resources:

- www.excarbs.com
- www.diabetes.ca
- Walsh,John and Ruth Roberts. Pumping Insulin. Everything you Need to Succeed on an Insulin Pump.
- Scheiner, Gary. Think Like a Pancreas. A Practical Guide to Managing Diabetes with Insulin.