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Department of Nutrition and Dietetics

Information about exercise and Diabetes for children and young people on Multiple Daily Injection therapy (MDI)

Being active is an important part of a healthy lifestyle. Being more active can however make blood glucose levels harder to manage at times. This information sheet will help you to understand how to keep your blood glucose levels stable during exercise.

About exercise and Diabetes

You need to know a bit about different kinds of exercise to help you keep your blood glucose levels stable. Your blood glucose levels can be affected by:

- Different types of exercise (aerobic or anaerobic);
- The amount of insulin in your body;
- How long your exercise or activity lasts. Exercise that lasts longer than one hour will normally have more of a blood glucose lowering effect.

What happens during and after exercise?

We have a store of fuel (glycogen) in our muscles and liver that can be used for energy at the beginning of exercise. The stores usually last about 45 minutes. If insulin levels are high (for example just after a meal injection) the liver cannot produce glucose from its stores for the muscles to use and blood glucose can drop rapidly.

Remember: you need just enough insulin during exercise to allow your liver to produce enough glucose for your working muscles.

Caution: low insulin levels allow the liver to release too much glucose and ketones may appear. If you have ketones and a high blood glucose level you need to treat this before you exercise.

Aerobic exercise (which uses oxygen) will usually lower your blood glucose during and after exercise, examples include running, swimming, and cycling.

If your exercise lasts longer than 30 minutes you will probably need to reduce your insulin and/or have extra fast acting carbohydrate.

For exercise that lasts for less than 30 minutes you may not need to lower your insulin but you may need a little extra carbohydrate.

Anaerobic exercise (exercise which does not need oxygen) may make your blood glucose rise during the exercise and fall after the exercise. Anaerobic sports are usually short, sharp and fast or strength and power sports. Examples include, sprinting, basketball, weight lifting.

Some sports will be a mixture of aerobic and anaerobic exercise, such as football and team sports. Mixed exercise may produce steady blood glucose levels.

Exercise can lower blood glucose levels for up to 12 hours. You may be more sensitive to your insulin after exercise. This may mean that you need to use reduced amounts of background insulin at night and with your meals after exercise. Sometimes blood glucose levels can increase immediately after exercise. If this happens you may need to use a ½ correction dose. High blood glucose levels at the end of exercise may drop without extra insulin.

Checking blood glucose levels is the only way to learn what happens during exercise.

Blood glucose monitoring and exercise

Check your blood glucose levels before any exercise, every 20-30 minutes during exercise and at the end of the exercise and between 2.00am and 3.00am after vigorous/hard or long bouts of exercise. This will help you to understand how different types of exercise affect your blood glucose levels.

Adjusting your insulin

You should aim to keep your blood glucose level around 6-8mmol/L immediately before and during exercise; you can adjust both the long acting background (basal) and fast acting food (bolus) insulin to do this.

Fast acting meal time insulin (bolus insulin)

If you eat one to two hours before exercise then you can make a reduction in your mealtime fast acting insulin dose to help prevent low blood glucose levels during sport and then make a similar reduction with food eaten after exercise to prevent low blood glucose levels after exercise.

- Lower your insulin by 25-75% if you give an injection with a meal one to two hours before exercise.

- If your exercise is more than two hours after a meal and insulin injection bolus you may not need to make any reductions.

Meal time insulin should be injected before eating before exercise, also try and use the same injection area for regular exercise. For example if you have a regular training session after an evening meal always give your insulin in the same area for the meal before exercise on that day. You should also think about avoiding injection sites that are near the active muscles, for example, try avoiding your legs if you are running.

Background insulin

Your long acting background insulin may also need to be adjusted to help prevent low blood glucose levels after exercise.

You may find this easier if you have two injections of long acting insulin a day, one in the evening and one in the morning. This will mean you can adjust your day time and night background insulin levels separately.

Long acting insulin doses will need to be reduced:

- when you are going to be active all day;
- when your activity is strenuous and;
- If you will be exercising again the next day.

Background insulin may need to be reduced by 25-50%.

Active insulin

If you use a smart blood glucose meter with a bolus wizard/advisor you can check how much active insulin is present before you do any exercise. If your blood glucose level is OK and you have active insulin you should take some extra carbohydrate before you start. Reverse your insulin to carb ratio; if your ratio is 1unit to 10g carbohydrate take an extra 10g fast acting carbs at the beginning of the exercise for every unit of active insulin.

Blood glucose before exercise

Aim to have a blood glucose level around 6-8mmol/L before and during exercise. If your blood glucose level is above 14mmol/L you should check for ketones. You can exercise with a higher blood glucose level without ketones, but you must check your blood glucose levels and drink plenty of fluid. If your blood glucose level is between 5 and 8mmol/L start having any exercise snacks at the beginning of your activity.

Use the table as a guide

Blood glucose	Aerobic exercise	Anaerobic exercise
Less than 5mmol	Bring blood glucose back to normal, have extra carbohydrate at least 1g/kg per hour of exercise	Bring blood glucose back to normal, have extra carbohydrate at least 1g/kg per hour of exercise
5 - 8mmol	Have exercise snacks, 15g for each 30 minutes of activity.	No changes required if the activity is less than 30minutes. Consider exercise snack if exercise lasts longer than 30 minutes.
8 – 11mmol/l	No change required for activities less than 45 minutes. If exercise lasts longer than 45 minutes exercise snacks will be needed.	No changes required if exercise is less than 30 minutes. Exercise snacks may need additional insulin.

11 + mmol/L	Between 11 and 14mmol/L you may not need a correction dose unless you have ketones. Check for ketones and correct* blood glucose if ketones are present. Have exercise snacks with insulin for performance. Drink fluid during exercise **Above 14mmol/L consider taking a ½ correction to lower blood glucose levels**	Between 11 and 14mmol/L you may not need a correction dose unless you have ketones. Check for ketones and correct* blood glucose if ketones are present. Have exercise snacks with insulin for performance Drink fluid during your exercise Above 14mmol/L consider taking a ½ correction to lower blood glucose levels

*Only use half corrections during exercise

If you have a high blood glucose level and ketones you should delay exercise until the ketones are no longer present.

Keep a record of the insulin adjustments you make and your blood glucose responses to different types of exercise. This will help you to plan the insulin adjustments you need to make.

Exercise snacks

Carbohydrate snacks can be used to prevent low blood glucose levels during exercise. The amount you need will depend on the insulin adjustments you have made and the type and duration of activity you are doing.

Aerobic exercise that is more strenuous or intense or that lasts longer than 45 minutes can need 1g carbohydrate for every kilo you weigh.

To start, try having 10-15g of carbohydrate for each 30mins of activity and monitor your blood glucose levels regularly (every 20-30 minutes). The amount of carbohydrate you need will vary with different activities as some sports use up more calories (energy) than others.

Suitable exercise snacks

- Sports drinks/gels;
- Jelly sweets;
- Ordinary sugar containing drinks (not fizzy);
- Dried fruit;
- Jaffa cakes.

Drinks for sport

It is important when you are being active that you have plenty to drink

- Drink 2-300ml water or dilute sugar free squash, before any exercise;
- Try and drink during your exercise as well, about 100ml every 10-15 minutes;
- If you are exercising for an hour or more always have a sports drink, then you get the fluid you need and the extra carbohydrate as well;

- If you are exercising for less than 60 minutes water is fine if you have carbohydrate snacks. You can use sports drinks if you need extra carbohydrate.

Sports performance snacks

If you exercise for 60 minutes or longer and need sports performance snacks you may need to inject for these snacks. During exercise use a reduced dose of fast acting insulin. Try half your normal insulin to carbohydrate ratio and check blood glucose levels every 20 to 30 minutes if possible.

Food after exercise

Eat a snack before bed whenever you have done 60 minutes or more exercise in the afternoon or evening. This helps to maintain blood glucose levels overnight. A mixture of carbohydrate and protein helps your muscles and liver to replace their glycogen stores. Examples of good bed time snacks include milk shake and fruit, cereal and milk, crumpets with peanut butter.

Useful contacts:

Diabetes UK Tel: 020 74241000

Careline Tel: 0845 120 2960
Website: http://www.Diabetes.org.uk

Diabetes UK is a useful source of additional information about Diabetes, for you to read, order or download. They also have books to buy, details of local Diabetes groups and general news/articles about Diabetes.

Coventry and Rugby Paediatric Dietitians
Telephone: 024 7696 6161

This information is based on information produced by Francesca Annan BSc, MSc, RD Paediatric Dietitian Alder Hey Children's Hospital Liverpool.

The Trust has access to interpreting and translation services. If you need this information in another language or format please contact 024 7696 6161 and we will do our best to meet your needs.

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