

Living and racing with diabetes

About Team Novo Nordisk

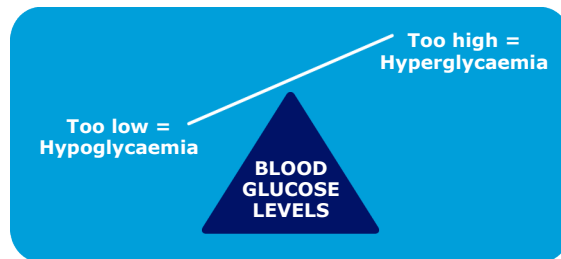
Team Novo Nordisk is a global all-diabetes sports team of cyclists, triathletes and runners, spearheaded by the world's first all-diabetes professional cycling team. The men's professional cycling team races on the International Cycling Union (UCI) Professional Continental tour, competing in major professional races around the world. The team's mission is to **inspire, educate and empower people affected by diabetes**, by showing what may be possible while living with diabetes.

What is diabetes?

There are an estimated **415** million people living with diabetes worldwide, which is approximately one in eleven adults. This figure is expected to rise to **642** million by 2040, with both type 1 but particularly type 2 diabetes increasing in prevalence across the globe.¹

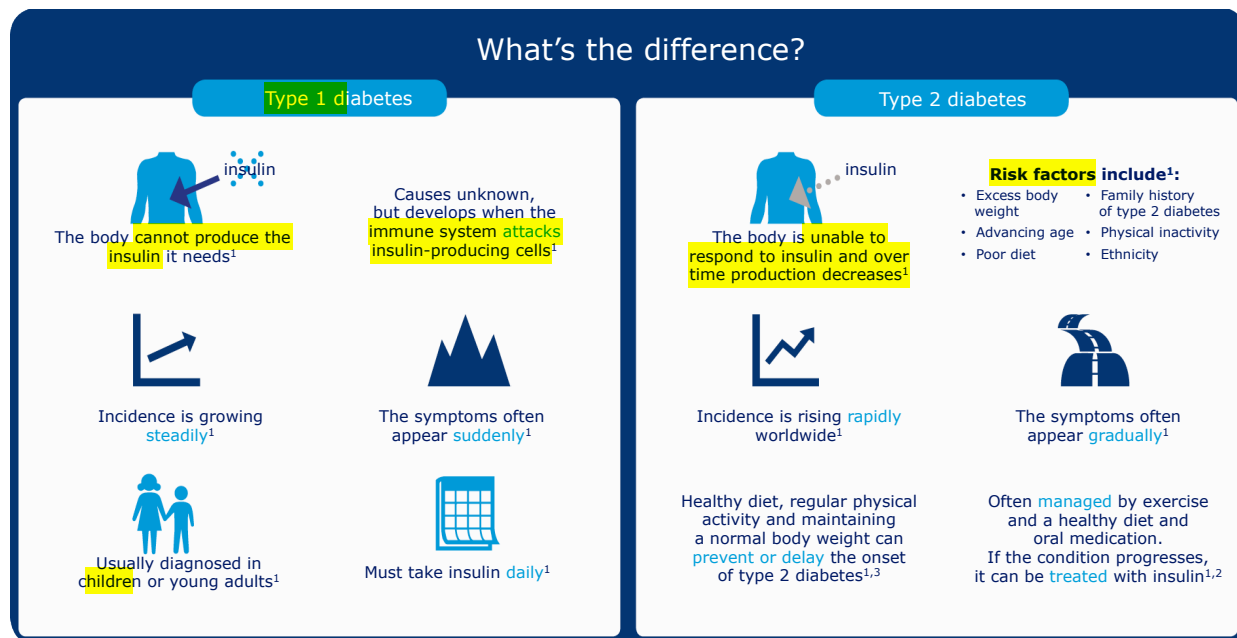
Diabetes is a long-term medical condition that occurs when the **pancreas does not produce enough insulin** or when the body cannot effectively use the insulin it produces. Insulin is a hormone which regulates blood sugar. Our bodies break down sugar and carbohydrates from our food and drink into glucose. Insulin then acts like a key that lets the body's cells take in glucose and use it as energy.¹

Without insulin, glucose stays in the blood stream and damages the body's tissues over time. When blood glucose levels become too high, it is known as **hyperglycaemia**, when they get too low, it is known as **hypoglycaemia**.¹



In the long term, hyperglycaemia can cause damage to eyes, kidneys, nerves and blood vessels, and complications can include disabling and life-threatening health complications, such as amputation and kidney failure.^{1,2} Hypoglycaemia can also be dangerous and can cause seizures and loss of consciousness if not treated right away.²

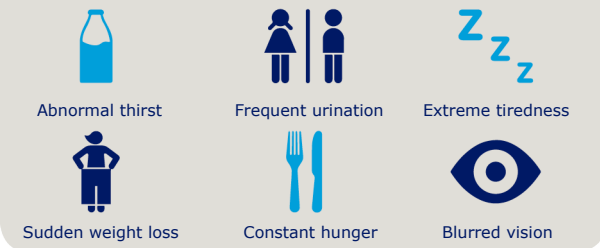
Type 1 diabetes and type 2 diabetes are two different diseases and the epidemiology of each disease is different. Below is a simple diagram to help differentiate between the two conditions.



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Symptoms of type 1 diabetes often appear suddenly and it is usually diagnosed in children or young adults. There are many risk factors for developing type 2 diabetes and symptoms often appear gradually. It is important to diagnose type 2 diabetes as early as possible to ensure **appropriate care and treatment** is put in place.¹ People with diabetes can live long and healthy lives if their diabetes is recognised and well-managed.² Self-care behaviours, including healthy eating, being physically active and monitoring blood sugar, can improve glycaemic control and quality of life for people with diabetes.⁴

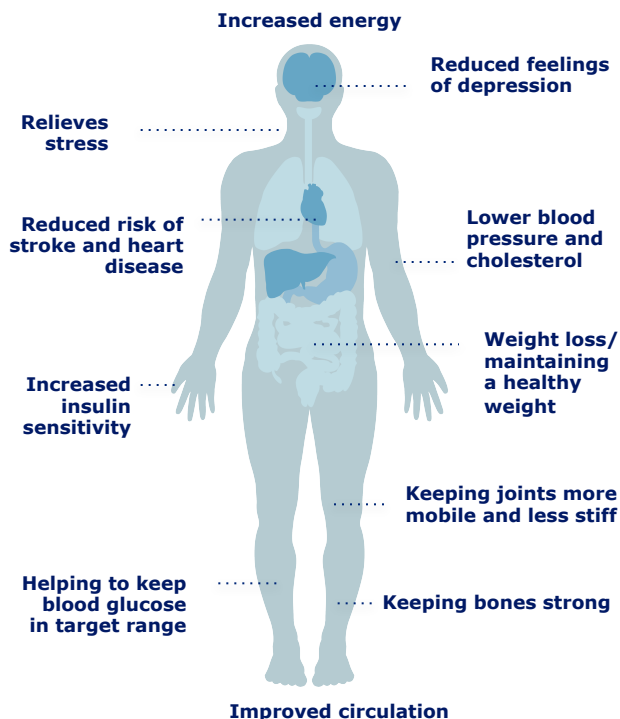
Symptoms of type 1 and type 2 diabetes may include:¹



Exercise and diabetes

Physical activity is recommended for the management of both type 1 and type 2 diabetes.^{1,2,5,6} In addition to the general health benefits of physical activity, such as reducing body weight and the risk factors for cardiovascular disease, exercise can improve blood glucose control and insulin sensitivity so that the body's insulin, or the insulin medication, is able to work better.^{2,5,6}

The benefits of exercise to both people with and without diabetes include:⁵



During exercise, blood glucose levels can go down due to the muscles using glucose as energy and the body can become more sensitive to insulin.¹ However, sometimes blood glucose increases due to other factors, for example, the effect of other hormones that are also released during physical activity, such as adrenaline.⁷

Everyone's diabetes is different, and individuals react differently to exercise. It is important that people with diabetes understand how their blood glucose responds to exercise so they can manage these fluctuations and prevent hypoglycaemia or hyperglycaemia.^{8,9} Exercise must always be prepared for in advance, and insulin or food adjustments might be needed in order to stay within the optimal blood glucose range.^{6,8,9}

Type 2 diabetes and exercise

The development of type 2 diabetes is associated with obesity, particularly **abdominal obesity**^{2,10} and it is estimated that around **60%** of type 2 diabetes is preventable by changing diet, increasing physical activity and improving the living environment.^{3,7,11} In addition, many people living with type 2 diabetes successfully bring their blood glucose levels under control by changing their diet, losing weight, implementing necessary self-care behaviours and taking oral medications.¹²

People living with type 2 diabetes do not usually experience such pronounced blood glucose fluctuations during exercise and hence hypoglycaemia is less of a problem.^{6,7} If insulin therapy is required, exercise may need more thought and planning but medication should support lifestyle changes, not replace them.¹²

Abdominal fat more readily releases fatty acids into the blood, which inhibits the effect of insulin, and fat cells produce hormones which also inhibit the effect of insulin. This is known as **insulin resistance**, which is the cause of type 2 diabetes. Exercise can help someone overweight or obese to lose weight, including abdominal fat, and reduce insulin resistance.¹⁰

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Three to five days of aerobic exercise per week, totalling at least 150 minutes, is recommended¹²

Aerobic exercise will differ depending on a person's individual fitness level, but could include walking, swimming or bike riding, and should be intense enough to raise the heart rate.

Type 1 diabetes and exercise

Exercise can pose some unique challenges for people living with type 1 diabetes as many variables can potentially cause blood glucose to fluctuate significantly.⁷ A person living with type 1 has to carefully balance their insulin dose with the carbohydrates they eat/drink and the amount of exercise, as well as taking into account other considerations which can affect blood glucose.^{6,7,8,9}

Getting the balance right to avoid potentially dangerous hyperglycaemia or hypoglycaemia can sometimes be complicated. Therefore, it is especially important for people living with type 1 diabetes to frequently monitor blood glucose levels before, during (for exercise duration of more than 1 hour) and after exercise. It is important to learn individual response to different types of physical activity through observation. This, along with frequent blood glucose monitoring, will help adjust blood glucose levels and avoid hypoglycaemia.^{7,8,9}

Lessons from Team Novo Nordisk⁸

Professional cycling is widely regarded as one of the most physically challenging endurance sports. Riders undertake demanding training and racing schedules and must work at high intensities for many hours at a time. Team Novo Nordisk is the first professional cycling team to consist solely of people with diabetes. The riders manage their diabetes while training and competing at a professional level.

Team Novo Nordisk athletes work hard to manage their diabetes and work closely with the team doctor to find a regimen that works for them. Athletes closely monitor their blood sugar before, during and after the race, developing a deep understanding of how their body responds to exercise. They learn how to adjust their nutritional intake and insulin to stay within the optimal blood glucose range.

If the athlete's blood sugar is above target, they may take medication. If their blood sugar is below target, they may eat or drink something with carbohydrates. Everyone is different and it is important for individuals to work with a healthcare professional to find the method that works for them.

The achievements of Team Novo Nordisk demonstrate that as long as people are educated about their condition, and are disciplined and committed to managing their diabetes, with the help of experienced healthcare professionals, diabetes does not need to preclude them from intense physical activity and even endurance sports.

Just like the Team Novo Nordisk athletes, people with diabetes who want to progress from regular exercise to endurance sports should speak to their healthcare professionals first and follow an **individually designed training programme**.

References

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Q&A with Dr. Rafael Castol



About Dr. Castol

Dr. Rafael Castol helped design and implement the Team Novo Nordisk medical programme. He specialises in sports medicine and exercise science (sports injuries, elite athlete development, sports nutrition and pharmacology, elite athlete testing and training, exercise metabolism and physiology, hormonal response to exercise and sports biomechanics), among other sports-related areas.



Do the Team Novo Nordisk riders need special food?

"Like other endurance athletes, the Team Novo Nordisk riders need a nutritious, well balanced diet. The key difference for our riders is that they need to carefully balance their food with their physical activity and insulin intake. The aim is to keep their blood glucose in the target range at all times for optimal performance."

"The riders are taught how to count and identify carbohydrates according to their Glycaemic Index and the speed at which each type of carbohydrate can be absorbed by the body (i.e. slow releasing energy and fast acting carbohydrates) so they know their individual requirements, and how to adjust their insulin regimen to stay within the optimal blood glucose range. Good hydration is essential for all athletes but is particularly important in athletes with diabetes as high blood glucose levels can lead to dehydration and imbalances in electrolyte fluid."



How do the riders know how much insulin to take?

"The riders go through a long learning process in our Development Team, learning and honing their insulin doses through structured trial and error, looking for patterns and trends in their blood glucose response. By the time they get to the Professional Team they are pretty self-sufficient, and know their own bodies very well, but continue to closely monitor and refine their diabetes management."



Do different types of races affect the Team Novo Nordisk riders' blood glucose differently?

"The effect of exercise varies for each individual, but is also influenced by exercise variables such as intensity, frequency and duration, as well as the types of muscle fibres stimulated. Weather, temperature, altitude, hydration levels, circadian rhythm, jet lag, and adrenalin are also factors that have a direct effect on blood glucose. Each rider develops a deep understanding of how their body reacts, so they can tailor their nutrition and insulin dosage."



How do the Team Novo Nordisk riders check their blood glucose during racing/training?

"Our riders check their blood glucose with a portable blood glucose meter and also wear a CGM, or Continuous Glucose Monitor, which gives a glucose reading every few minutes. During a race, they put the CGM receiver in their jersey pocket or mount it onto their handlebars. It provides a graph in real-time of their blood glucose levels."

"It's particularly important to check blood glucose before, during and after the race. The riders have also learnt to listen to their bodies, and the way they react and feel during a race. They aim for an optimum blood glucose range of 6.6 to 10mmol/L or 120 to 180mg/dl. However, it's very important to remember that every individual is different, and what works for one person may not work for someone else. Each athlete has their own tailored approach to managing diabetes and exercise."



Are riders with type 2 affected in the same way as the type 1 pro-team riders?

"With type 2 diabetes, blood glucose does not usually fluctuate as drastically as with type 1, unless they have become insulin dependent. So while it's still important to check the blood glucose and eat a healthy diet, people living with type 2 diabetes can be less affected by changes in the environment."



Is it safe for people with type 1 and type 2 diabetes to participate in tougher sports?

"Cycling is one of the most difficult sports to compete in and diabetes management can be quite challenging when racing at that level. When you combine the two, many think it's impossible, but it's something our team embraces. We just have to be very individual in our approach. We want to show that our riders struggle with a lot of the same challenges that other people with diabetes struggle with, but it shouldn't stop you from being at the top of your game."

Reference

Fisher M, et al. Lessons from the professionals: diabetes and pro cycling. *Practical Diabetes*. 2013;30(7):266-270

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A typical race day for Team Novo Nordisk: Managing intense exercise and diabetes

The Team Novo Nordisk medical team has created a system of training and nutrition, based on guidelines and literature for the management for type 1 diabetes in endurance exercise. To help stay within the optimum blood glucose range and perform at their best, the pro riders closely monitor their blood glucose, hydration, what they are eating, and the amount of insulin they are taking. They are also prepared to treat hypoglycaemia and hyperglycaemia.

It's important to note, every athlete will have their own approach to managing diabetes, based on their individual blood glucose response.



The days before the race

The riders gradually increase the amount of complex carbohydrates and protein they eat, which is slowly turned into **glycogen** and stored in the liver and muscles. This process is sometimes referred to as 'carb-loading'.



The morning of the race

Breakfast is usually high in carbohydrates, made up of complex grains or cereals, sometimes with a portion of protein. If riders need to ride to the start line, they may have an extra 15g of carbohydrates to help them stay within the optimal blood glucose range.



At the start line

Just like other athletes, the riders can get pre-race excitement and nerves. **Adrenalin** can suppress the effect of insulin, leading to an increase in blood glucose. By knowing their own bodies the riders can anticipate this and compensate with insulin or food adjustments.



The first 2 hours of the race

The race tempo can be high as the main peloton tries to prevent a breakaway from forming. **Anaerobic** exercise produces more lactate and **catecholamines**, which increase the rate the body breaks down its stored energy (glycogen) into glucose. Sometimes this can cause the riders to experience a blood glucose peak, but the intense physical activity can also use this blood glucose very quickly. Once a breakaway is formed, the tempo in the peloton decreases to a steadier pace.



2 – 4 hours / mid-section of race

The steadier pace is **aerobic** exercise, and as the body uses glucose for energy, the blood glucose gradually drops. The riders eat gradually, around every 20 – 30 minutes. This can be energy bars, fruit bars, and mixed carbohydrate and electrolyte drinks. If blood glucose is above target, a protein bar can help their hunger without increasing blood glucose. Upfront, the breakaway group rides at a higher tempo, requiring more energy. Riders eat at a higher rate to prevent their blood glucose levels from falling.



The last hour

The last hour requires intense effort. By now, the riders' glycogen storage is significantly reduced, so they will normally need fast-acting energy from foods such as energy chews, jelly beans, or glucose tablets, and mixed carbohydrate and electrolyte drinks.



The last sprint

Fast-acting energy is needed for the full speed at the end of the race, sprints, or the last km of a mountain stage. The last 20km of a race tends to be **anaerobic** exercise – but, this anaerobic threshold is different for each rider. This increases the rate the body breaks down its stored energy (glycogen) into glucose, but this glucose can be used very quickly. So, it's important the riders keep checking their blood glucose.



After the finish

The riders are encouraged to do an active, 20–30 minute cool down on a turbo trainer (static bike) or by cycling back to the hotel. Any excess glucose is then taken up by the muscle cells and stored as glycogen. The riders usually drink a carbohydrate drink which is very high in carbohydrate: about 70g carbohydrate in 1.5 litres of water. This helps replenish the body's glycogen storage and is called 'post-race recovery'. The body is most efficient at this in the hour after the race.



Hours after the race

The riders usually eat a carbohydrate/protein mix meal or have a protein shake to help repair muscle damage.



Dinner

The evening meal after a race tends to be lower in carbohydrates. This is because the riders have already replenished their glycogen stores. They are encouraged not to sleep straight away so their food is properly digested and blood glucose levels have stabilised.



Rest days

As exercise increases **insulin sensitivity**, the riders may need to adjust their long-acting and meal-time rapid-acting insulin according to their training and race schedule.

Reference

Fisher M, et al. Lessons from the professionals: diabetes and pro cycling. *Practical Diabetes*. 2013;30(7):266-270

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Glossary

Glycogen = a form of stored glucose in the body. It can be broken down into glucose for energy

Catecholamines = hormones made by the adrenal glands, released when a person is under physical or emotional stress

Anaerobic exercise = activity that uses large muscle groups that do not require oxygen for short periods

Aerobic exercise = activity that uses large muscle groups that need oxygen for sustained periods

Media:

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