## TYPE 1 DIABETES AND SPORT IT DOES NOT NEED TO SLOW YOU DOWN

A guide to maintaining good health and unlocking performance in endurance sport

## TAP INTO TECH

Game-changing technology to improve diabetes management

## OWN YOUR ROUTINE

Set yourself up to focus

## MANAGE YOUR BLOOD GLUCOSE LIKE A PRO

Tips and strategies for optimising performance and recovery

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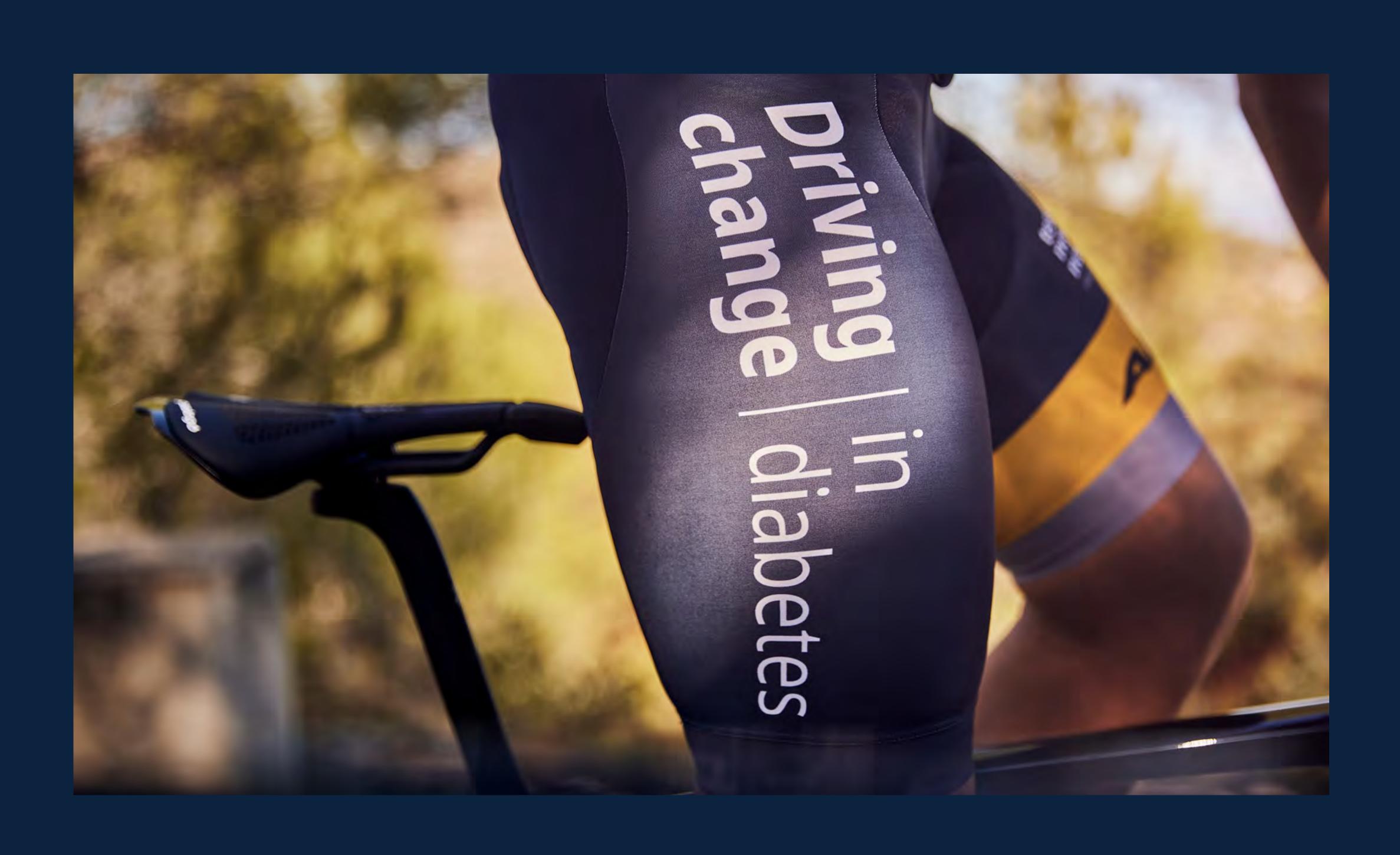




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Always consult your healthcare professional before making any adjustments to your diabetes management.



Team Novo Nordisk is on a mission to change the way the world views diabetes

## Nutrition

Recovery

## Getting started Learn from the pros

Team Novo Nordisk is the world's first all-diabetes professional cycling team. All the athletes on the team have type 1 diabetes. For more than a decade, Team Novo Nordisk has been racing to inspire, educate and empower everyone affected by diabetes worldwide.

Team Novo Nordisk has a multidisciplinary support team comprising doctors, nutritionists, performance coaches and more. Together with the riders, they have crunched the numbers, dived deep into the data and finely tuned a holistic approach to ensure peak performance while maintaining good health.

The resulting information is available in this guide. It can be used as a gateway tool for anyone interested in taking up or pursuing an endurance sport, in using strategies and approaches to improve performance by committing to an improved awareness of their own body's response to nutrition and training and in better understanding their blood glucose levels.

This guide is based on 10 years of learnings from the professionnal cyclists at Team Novo Nordisk. It shows that non-professional sport enthusiasts can improve their performance through good nutrition, a commitment to understanding and anticipating glucose response and an awareness of insulin sensitivity changes brought about by intense exercise repeated throughout a season.

YOU RACE. DOESN'T HAVE TO DECIDE 

> JOONAS HENTTALA TEAM NOVO NORDISK RIDER



## Everyone's diabetes is unique!

Getting started

Maintaining a routine



# Maintaining a routine



## **Own your routine**

A person living with type 1 diabetes will make around 600 decisions a day to manage their condition. That sounds like a lot and, truth be told, it is! And once you factor in sport or the adrenaline of competition, that number is likely to rise even further. Do not be put off! The skill of managing and predicting blood glucose trends and spotting anomalies is key to unlocking each person's best performance. Staying on top of it is achieved by creating good habits and sticking to a routine.

## You have to create healthy habits

A good routine is a base from which athletes can observe small changes in physiological response, such as exercise or insulin dosing, and then make informed tweaks to keep their blood glucose within a healthy range.

Having a routine and disciplining yourself to adopt everyday actions, such as eating particular foods at certain times or taking blood glucose readings at touch points throughout the day, reduces the decision-making load and will improve your ability to manage your diabetes in the moment and over the long term. The better the habits you consciously form now, the more automatic they will become in the future.

## But... no two days are the same!

This is true, and even similar training days will differ in ways that can affect blood glucose and insulin response. Temperature, hydration and even the quality of sleep the night before all impact how blood glucose levels behave.

## Protip 쉽

Travel, especially air travel, means a break in your routine and can have profound effects on your ability to manage blood glucose levels. Everything from the foods (or lack of particular foods) at the airport and the dehydrating effect of air travel to the disruption to everyday habits and routine have an impact. This is often compounded by different time zones – so these are times when you need to be extra careful.

Assume that there will be nothing suitable on offer and pack the food and snacks you need, plus extra in case you are delayed.

Remember, you cannot leave that metal tube until you arrive: prepare, pack and hydrate accordingly!

## Diabetes management tools

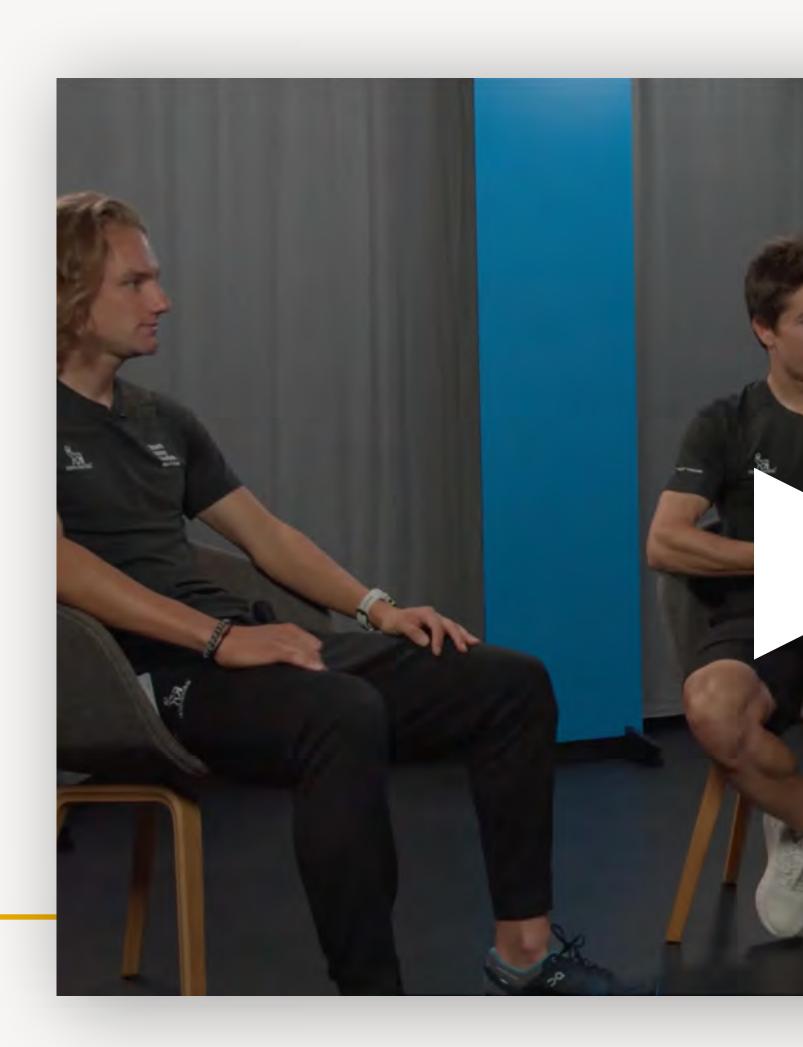
## Tap into tech

People living with diabetes need a deeper understanding of their body, especially when engaging in high-intensity exercise. It is essential to understand how YOU process and respond to training, nutrition, hydration, sleep and recovery. The riders at Team Novo Nordisk do not see this aspect as a disadvantage: the ongoing management of their condition provides a window into their physiology. The athletes are exceptionally skilled at managing blood glucose levels, but this is an acquired skill, and you could learn it too.

Everyone has their own experience to draw on, and technological means such as continuous glucose monitoring (CGM) devices play an essential role in deepening that understanding. CGM has enabled Team Novo Nordisk to accurately determine the impact of variables on blood glucose and observe long-term trends in detail. It has provided a complete picture of the effects of nocturnal hypoglycaemia a notable but manageable risk factor for people with diabetes engaging in intense or endurance sport.

## Spotlight on CGM

A CGM system is a compact system that monitors glucose levels. These devices have revolutionised personal diabetes care. A small sensor that penetrates the top layer of skin is held in place by an adhesive patch that can take glucose readings in the fluid that surrounds cells 24/7. A transmitter sends real-time readings wirelessly to a device or smartphone that displays blood glucose data.



Team Novo Nordisk riders discuss tech developments and how they make use of them

## Watch the video $\rightarrow$

## Nutrition



THE CGM IS SUCH A GAME CHANGER. THE DATA'S ON MY PHONE SO I'M ALWAYS CHECKING, THINKING, CONSIDERING THE DATA - IT'S SUPER HELPFUL IN SPOTTING A TREND AND MAKING INFORMED DECISIONS ABOUT MY INSULIN."

MANDY MARQUARDT TEAM NOVO NORDISK SPRINT CYCLIST

## A team's approach to Blood glucose management

### In the zone

Multi-stage cycling events pose extra challenges because the period of exertion takes place over consecutive days. A person living with type 1 diabetes must monitor their glucose closely throughout the day including before, during and after races and be aware that insulin sensitivity will be impacted. Hypoglycaemia is an everyday concern for Team Novo Nordisk athletes and a significant challenge throughout a multi-day stage race, given that insulin sensitivity increases over time. This means that less insulin will be required to reduce blood glucose levels. A high-carbohydrate diet provides the essential fuel for powering the body through the demanding schedule, yet managing this with type 1 diabetes is a challenge. We know consuming more carbohydrates leads to elevated blood glucose levels, which means more frequent insulin dosing. This, in turn, increases the risk of hypoglycaemia. But, with practice, it is manageable.

Diabetes management tools

## ULTIMATELY, A **COMMITMENT TO BLOOD GLUCOSE** MANAGEMENT AND A DESIRE TO **KEEP LEARNING IS WHAT UNLOCKS PEAK** PERFORMANCE."

**CHARLOTTE HAYES** HEAD OF DIABETES, WELLNESS & EDUCATION



## Nutrition











During a multi-day race, the total insulin requirements decrease – this is a physiological response that can be managed, but athletes should be extremely conscious of this. Adequately fuelling the body while keeping glucose levels stable is one of the most challenging balancing acts around. No playbook can tell you the specifics. Finding the right level requires trial and error, but this means refinement, not testing with extremes.

## Case study: Sam Brand Hit the road

## Plan of attack

Approaches to nutrition have evolved, and working with the nutritionist from Team Novo Nordisk has helped immensely. When a race is approaching, I'll lower my carbohydrate intake in the runup week, because I don't need the fuel I would on a race day, which enables my body to adapt. Two days just before the race, I'll eat more carbohydrates to replenish my energy stores. Pre-race meals are high in carbohydrates, combined with protein. It's essential to be fully fuelled for race day. Stable blood glucose levels throughout the night before are critical, because this helps them remain constant the next day. Hydration is a critical factor in managing blood glucose levels. If I race at the weekend, then hydration begins on a Wednesday.

## Start well

People say breakfast is the most important meal of the day, which certainly holds for me as a cyclist. Breakfast gives me the energy stores I need. I'll have a high-carbohydrate meal, but be mindful not to over-fuel, and what I eat must be the right combination of foods taken with the correct insulin dose.

## Race day

A big factor on race day is adrenaline. And that's different for everyone. It's taken years, but I can predict with a high accuracy what my adrenaline is likely to be before a race and what effect that will have on my blood glucose. Big races like the 300 km Milan–San Remo drives more excitement, nerves and adrenaline.

## IT'S INTENSE, AND EACH WEEK I SPEND AROUND 30 HOURS ON THE BIKE. WORKING WITH THE TEAM HAS **DELIVERED**A HUGE RISE IN MY FITNESS LEVELS, MY STRENGTH AND MY PERFORMANCE."

Staying relaxed the evening before the race is essential, because the adrenaline can kick in and cause your blood glucose to rollercoaster. I'll typically have breakfast three hours before the race, gather my kit together, speak to my parents for a last-minute pep talk, and listen to music to help me remain calm. I also test my blood every 20–30 minutes using a finger stick – while the CGM is good, I like to have the back-up. About an hour and a half before the race, I'll take on more fuel. At this point, anything you take on is unlikely to digest before the race, so this might be a liquid-based energy snack.

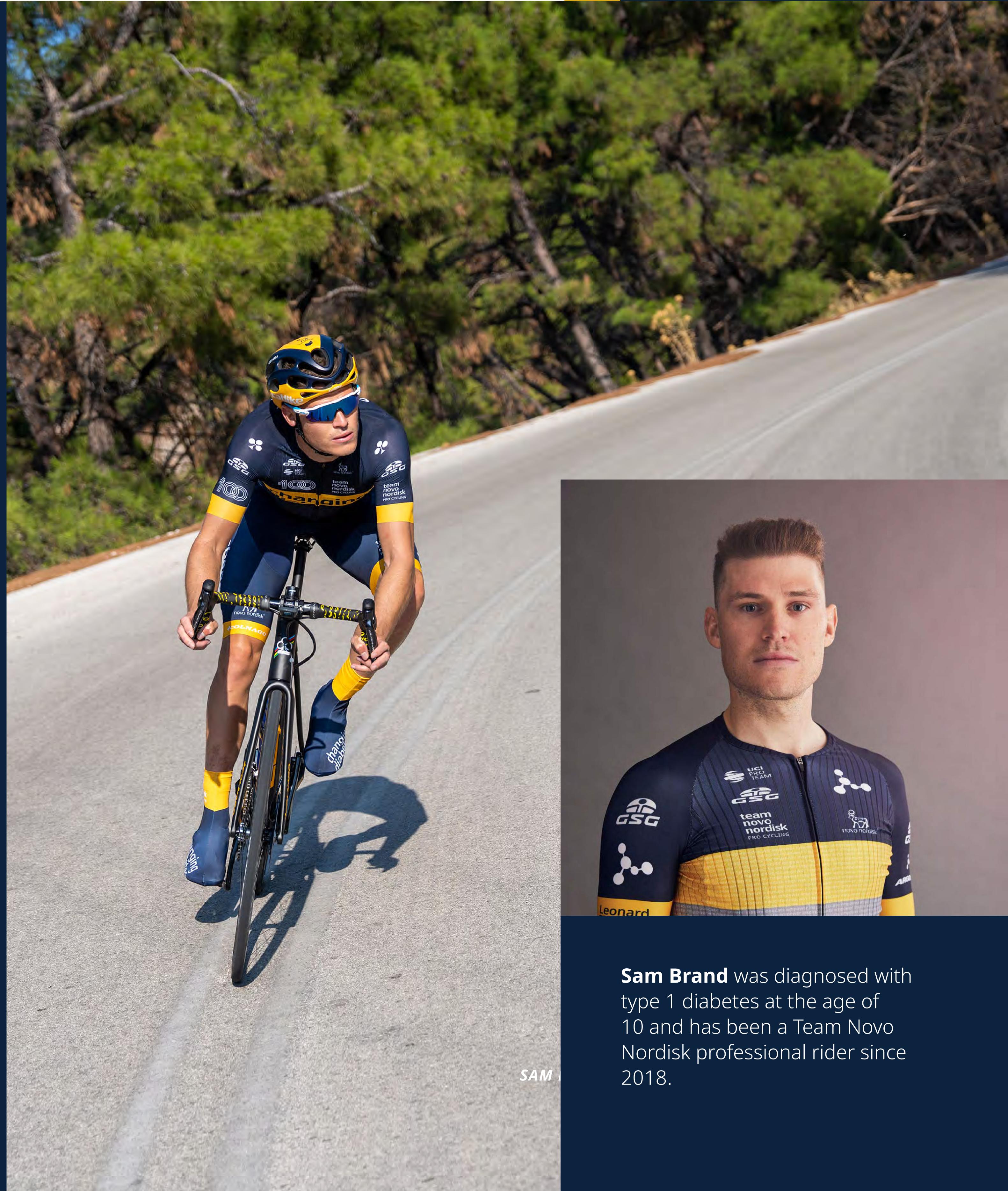
## It's never perfect – you just have to deal with it

The last hour is all about blood glucose control. If it's bouncing around before the race, that's sub-optimal. Nine times out of 10, you'll come up against something that's not ideal. Experience comes into play, and it's all about how you deal with what's happening.

### Blood glucose management

## Nutrition

## Recovery





## Blood glucose management Competition strategy/

Team Novo Nordisk riders employ a race-day approach, which differs depending on the planned duration and intensity of an upcoming race and whether it is a longer multi-stage cycling race or a single-day race. To support the riders in managing hypoglycaemia on race day, Team Novo Nordisk applies a practice-based protocol which draws on the '15–15 rule' to manage glucose lows and insulin dosing.

## The 15–15 rule

The American Diabetes Association's 15–15 rule is an easy-to-remember guideline for regulating blood glucose. If you are experiencing hypoglycaemia (blood glucose less than 3.9 mmol/l or 70 mg/dl), consume 15 grams of carbohydrate to raise your blood sugar and check it after 15 minutes. If it is still below 3.9 mmol/l or 70 mg/dl, have another serving. Repeat these steps until your blood sugar is at least 3.9 mmol/l or 70 mg/dl. Once your blood sugar is back to normal, eat a meal or snack to make sure it does not lower again.

**Learn more** about the Team Novo Nordisk glucose management and fuelling guidelines by reading *Type 1 diabetes and pro cycling: 10 years* of learning from the professionals here.

### The evening meal

optimises glycogen stores and hydration status for racing. This will depend on factors during the hours before the meal and the expected intensity/duration of the race the following day. **Insulin** dosing decisions for mealtime: any correction dose must be carefully

Disclaimer



The information provided in this article is not presented as a clinical guideline on managing diabetes when engaging in endurance sports and should not be followed as such.

### Blood glucose, carbohydrates (CHO) and fuelling

### Night before the race

- BG monitoring: capillary BG monitoring for insulin dosing decisions
- Close attention to sensor glucose level, direction and rate of change
- *Goal:* 120–180 mg/dl. (6.7–10.0 mmol/l)

### **Pre-race**

- BG monitoring: capillary BG monitoring for insulin dosing decisions Close attention to sensor glucose level, direction and rate of change *Goal:* 120–180 mg/dl. (6.7–10.0 mmol/l)

CHO and fuelling: rapidly absorbable carbohydrate sources for glucose < 100 mg/dl (5.5 mmol/l)

### During the race

**BG monitoring:** close attention to sensor glucose, including rate of change Capillary BG is advised for insulin dosing decisions when there is CGM rapid rate of change

*Goal:* 120–180 mg/dl (6.7–10.0 mmol/l)

CHO and fuelling:rapidly absorbable carbohydrate sources for glucose < 100 mg/dl (5.5 mmol/l)

### **Post-race recovery**

- BG monitoring: capillary BG monitoring for recovery insulin dosing decisions Close attention to sensor glucose level, direction and rate of change
- *Goal:* 100–180 mg/dl (5.6–10.0 mmol/l)

CHO and fuelling: rapidly absorbable carbohydrate for BG < 80 mg/dl (4.4 mmol/l)

## Getting started

## Maintaining a routine



## Diabetes management tools

## Nutrition

## Recovery

## Nutrition

## **Fuelling the fire**

Nutritional intake is critical for performance, for amateur enthusiasts and pro riders alike. It is vital to strike a balance between fuelling for exercise performance and managing glucose. Combining nutrition with an understanding of the likely impact on glucose levels is easier than it used to be with CGM. This will help you monitor glucose in near-real time,, even while exercising, and inform your decisions about adapting insulin or nutrition.

## **Fuelling considerations**

Based on the long-term trend analysis CGM data have unlocked, Team Novo Nordisk has observed and fine-tuned optimal nutrition strategies according to the specific demands of periods through the year. Calorie and carbohydrate intake vary throughout these periods to support a healthy and injury-free year, while engineering adaptations to ensure that peak performance coincides with the most important races.

## An introduction to periodisation

Periodisation can be complex, but it is essentially about manipulating variables so that peak performance coincides with a target, such as a competition. So what can we vary? Aside from training, which could alter in duration or intensity, it is also possible to tweak diet and nutrition to achieve optimal body composition going into a race. Adopting specific nutrition strategies will allow you to train hard, recover quickly and adapt carbohydrate intake to fuel competition. The two types of cycling (track and endurance cycling) necessitate very different types of fuelling, providing plenty of takeaways for athletes competing in other sports.

## **Team Novo Nordisk Cookbook**

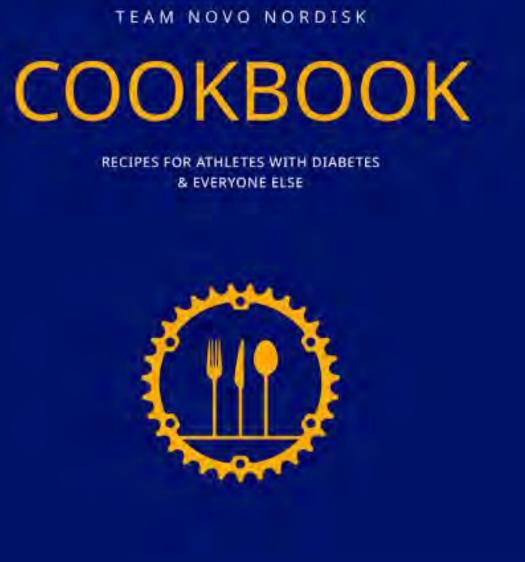
Having the right fuel is critical to achieving peak performance, and the good news is that healthy food does not have to be boring. Healthy food should always be delicious and nutritious. Team Novo Nordisk has created a cookbook that combines the search for nutritional perfection with the input of top chefs to create meals that taste great and are easy to put together. The book is packed with healthy, delicious and easy-to-cook recipes and helps you put the right fuel in your body.



Find hardcover version **here**.

Find digital version here.





We race to change diabetes.

## How nutritional strategies can be used to improve performance

When training demands are lower, your body needs less fuel. This is the time to decrease food portions. You want to be adequately fuelled for exercise, but you do not need extra energy stores.

As you move into pre-season training, you will engage in higher volume training and, with that, comes increased fat burn and a need to increase your aerobic capacity and metabolic efficiency. This is an opportunity for a nutritional adjustment. Keep breakfasts light and relatively low in carbohydrates, but when you step up into sessions lasting for three or more hours, you should increase the carbohydrate content. At dinner times, maximise your protein and vegetable intake.

As you shift towards competition, dietary adjustments are geared towards optimising your performance and recovery. This is an opportunity to boost the carbohydrate content of breakfast and lunch. You should still avoid high-GI foods, and hold back simpler carbs, such as gels, blocks and bars, for training and races.

## When else might adjustments be a good idea?

If you have a travel day, are injured, unwell or just scheduling in a rest day, nutrition should still be approached with performance in mind. Without making drastic changes, it is a good idea to reduce portion sizes and consume protein-rich meals with plenty of vegetables and some healthy fats.

## Diabetes management tools





## Nutrition







Make adjustments to your nutrition based around your predicted caloric needs.

Use the adjustments to meal content as a learning opportunity to see what blood glucose trends the CGM identifies as your food mix changes.

Maintain good levels of vitamins, minerals and healthy fats as cornerstones of your meals.

## Case study: Mandy Marquardt A strategy for short bursts of performance

Endurance cycling and sprint racing make very different demands on the body. Endurance is about drip feeding power over time, with some races stretching for hundreds of kilometres, while sprint riders need an explosive burst of intense power, often for very short periods, but several times in a day.

The fitness required to deliver flat-out anaerobic sprint performance means much more gym, weights and power work. During sprint races, the maximum-effort window can range from around 17 seconds up to a about a minute – it is all about explosive power. We spoke to Mandy Marquardt, Team Novo Nordisk's sprint star, about her approach to nutrition for race day.

## Moderately high carbohydrate approach

The carbohydrate needs for a sprint cyclist are quite high because of that anaerobic energy burn. Gym sessions involve total body lifts, a lot of squats and leg presses. This involves a lot of large musculatures in the lower body, and that burns through the body's glycogen stores quickly.

The diet is moderately high in carbohydrates, but lower than for an endurance cyclist. I tend to stay away from high sugars – I don't like the spikes they create and I prefer a protein shake, which still has carbs, but the glucose response is easier to manage.



## TAKING CARE OF MY HEALTH AND DIABETES MANAGEMENT HAS ALWAYS BEEN A PRIORITY, SO I CAN CONTINUE TO COMPETE WITH THE BEST."

The night before will be a higher-protein meal with a small carbohydrate portion, accompanied with a salad. On race day, I'll have a savoury breakfast: eggs, sausage, wholewheat toast with a protein shake with a low-GI sweetener. Caffeine elevates my blood sugar, so is best avoided.

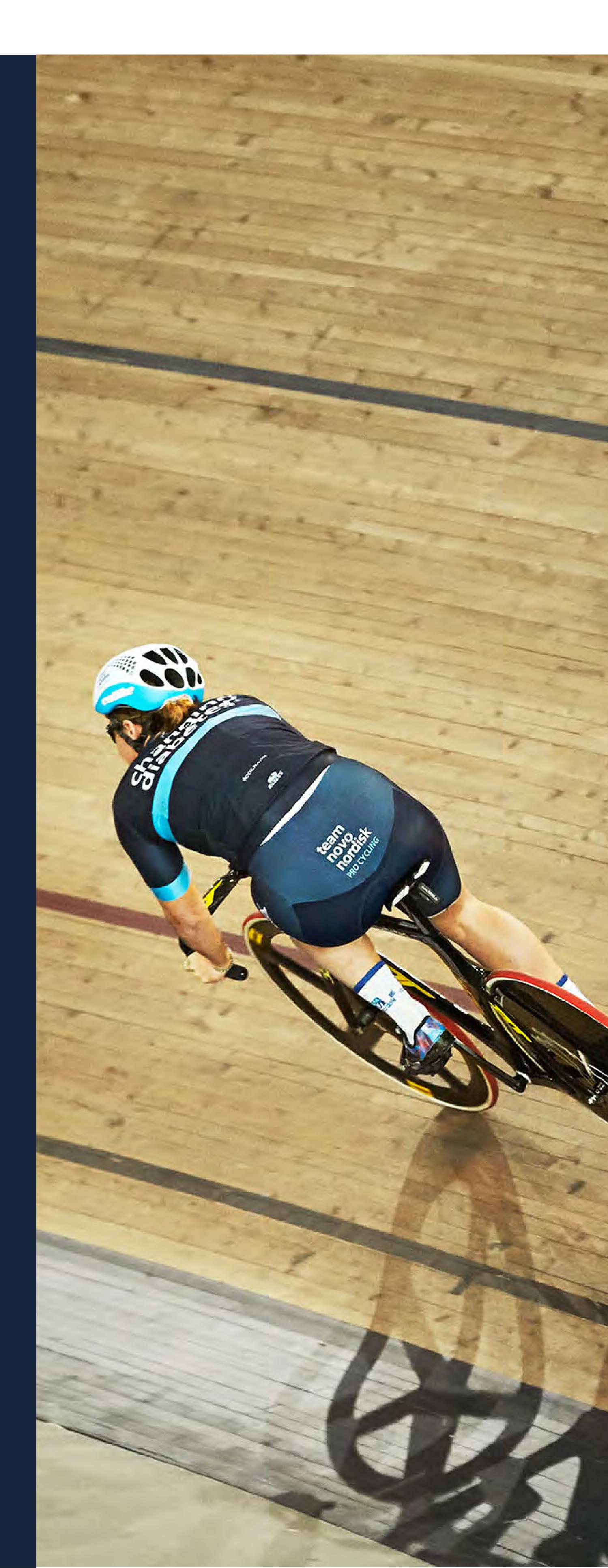
Throughout the day, I test, test, test! CGM coupled with the finger prick test. The velodrome can be a warm environment and that can have a rising effect on blood glucose. This is a possible (insulin or carbohydrate) adjustment time.

Between races, cucumbers make a great snack food: satisfying but essentially water. Snacks need to be kept light (for example peppers, apples, maybe peanut butter) because you don't want blood diverted to the stomach to support digestion.

I've experimented with adjustments to the timing of my longacting insulin. Precisely when insulin is taken around the evening meal and breakfasts can have a marked difference on performance. Moving doses slightly earlier has had a beneficial effect on night-time glucose stability, and how I feel when I wake Up.

## Nutrition









## Mandy Marquardt is a champion

sprint track cyclist. She was diagnosed with type 1 diabetes at the age of 16 and has achieved a stellar career. She is a 22-time American champion and a threetime national record holder.

## Getting started

## Maintaining a routine



## Recovery

## **Bouncing back**

How you recover from training or a race can punish or pay dividends for future performance. After intense exercise, there can be an elevated risk of night-time hypoglycaemia. CGM can play a valuable role in understanding, predicting and managing trends, late at night and even during sleep. Learning how to manage your risk of night-time hypoglycaemia is an important aspect of recovery, especially during a multi-day race.

There are four pillars to the recuperation strategy that aid recovery and ensure you are fit and fuelled for another day!

## 1. Refuel

Consume carbohydrates straight after the race or workout. Gradually resume your regular meal pattern to achieve stable blood glucose levels.

## 2. Rehydrate

Aim to drink enough to replace approximately 125% of the fluid deficit at the end of the session. This can be estimated by weighing yourself before and after the race or workout. Be mindful of replacing the electrolytes lost during the session. Combining drinking sports drinks with eating salty crackers can be an excellent strategy to promote fluid retention instead of significant urine losses.

## 3. Rebuild

Consume 20–25 grams of high-quality protein soon after the session, and continue to include reasonable portions of protein at subsequent meals. If the session was light or low in intensity, this could be incorporated into your regular meal schedule.



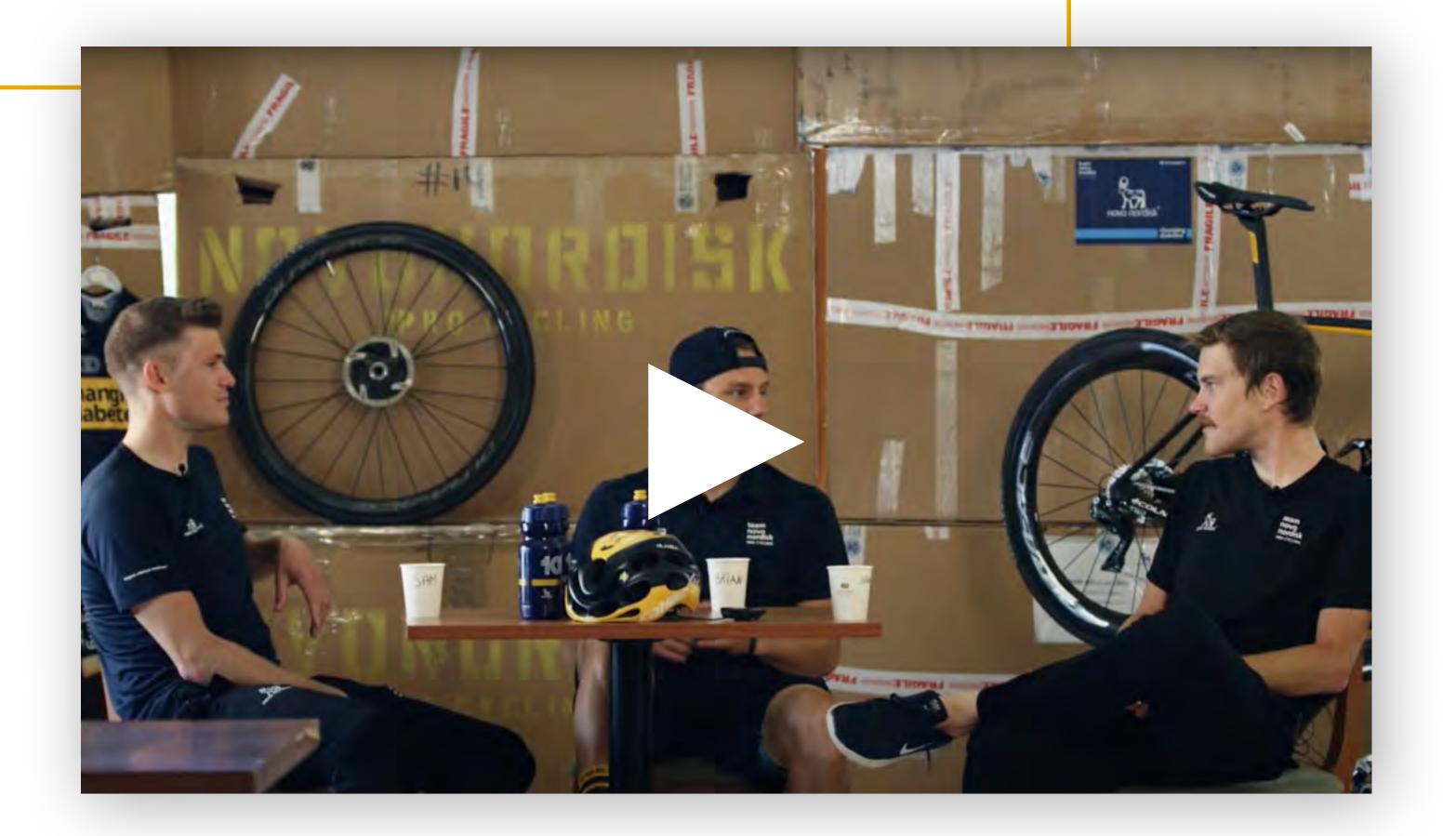
## 4. Regenerate

Consume a diet high in antioxidant phytonutrients (natural compounds found in plant foods such as vegetables, fruit, whole grain products and legumes), minerals and healthy fats to protect and support your immune system. Oily fish and brightly coloured fruit and vegetables are a great way to do this.

Detailed information on post-exercise recovery was recently covered in detail by Scott et al. (2021). Click here to read more.

Innovations, challenges and hopes in diabetes. A roundtable chat.

## Watch the video $\rightarrow$



## You CAN do it!

Remember, all the information presented here is based on the professional cycling team's experience and protocols. Team Novo Nordisk riders are carefully monitored and follow the advice of medical professionals. We hope the pro tips and explanations of the regime they follow are inspirational. Readers should always follow the advice of their own healthcare professionals to create a personal set of protocols that works for them.

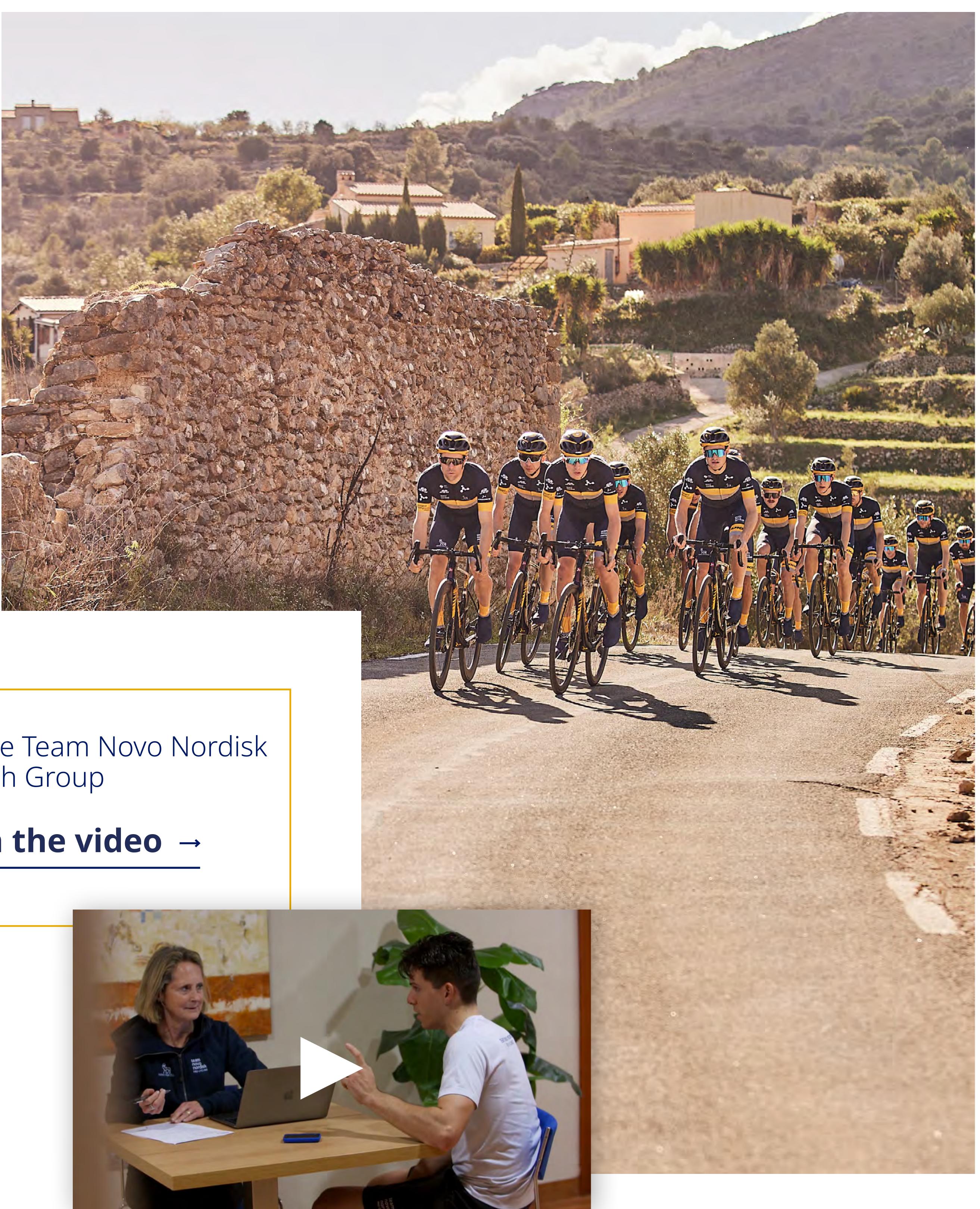
Excited? We hope so! The strategies covered here have helped elevate the performance of Team Novo Nordisk, and there are plenty of tips, and food for thought here. Our experience suggests that these approaches to nutrition, recovery, self-care and monitoring can help amateurs, enthusiasts and anyone with type 1 diabetes who wants to give endurance sports a go, and to do so safely.

## Protip

You can unlock superior performance by adopting a laser focus on routine – it will help you identify your own parameters and allow you to make incremental improvements that really add up.

CGM provides an invaluable window into your own physiology and can help you interpret and understand how food, training, resting and even sleeping affects your own blood glucose levels.

Through controlled experimentation, you can determine your own tailored nutritional, training and insulin dosing strategies.

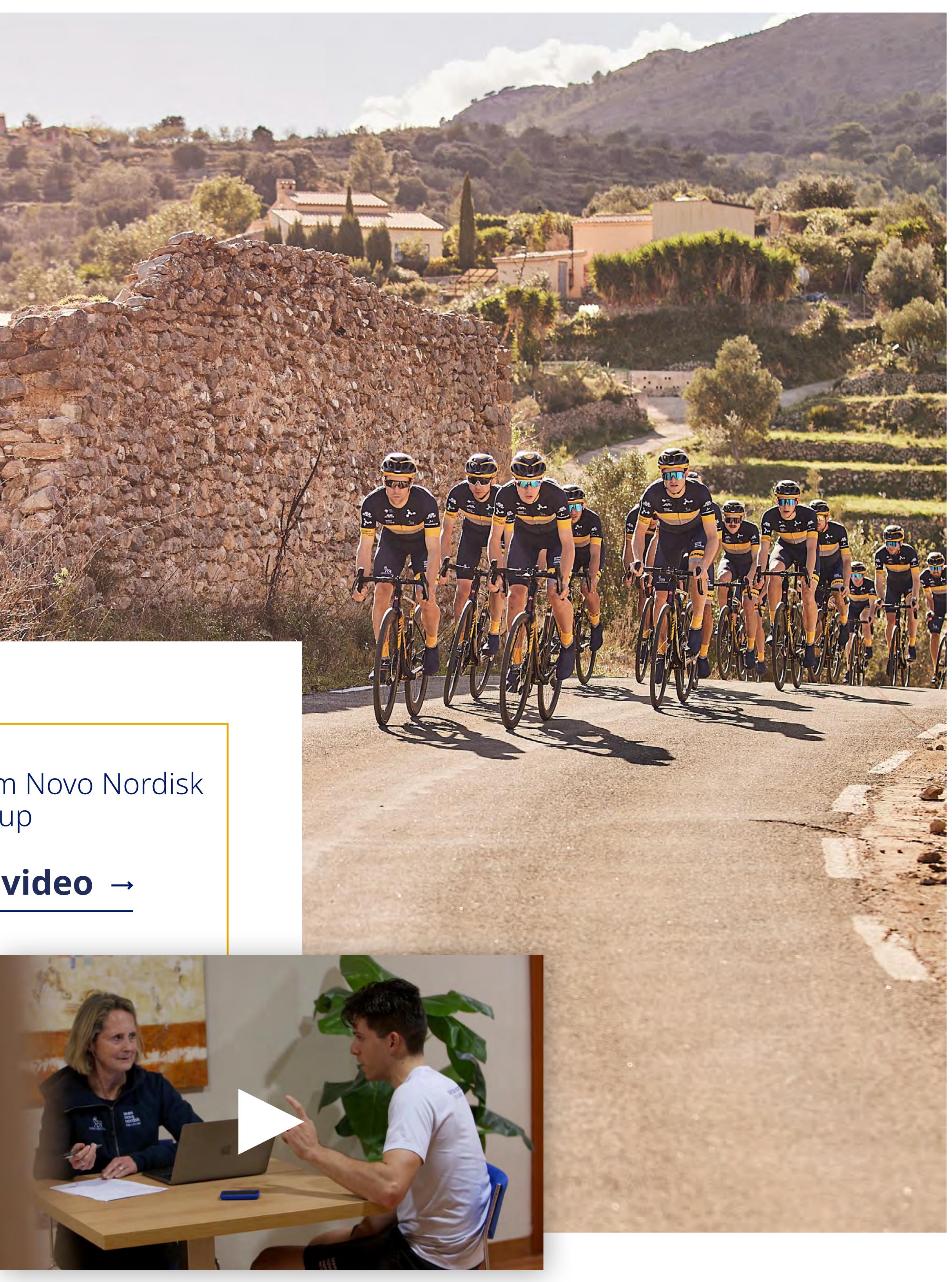




Meet the Team Novo Nordisk Research Group

## Watch the video →







## Home

## I'M HONOURED TO BE PART OF THE TEAM NOVO **NORDISK RESEARCH TEAM WHICH PROMISES TO INCREASE OUR** UNDERSTANDING **OF EXERCISE AND DIABETES.**"

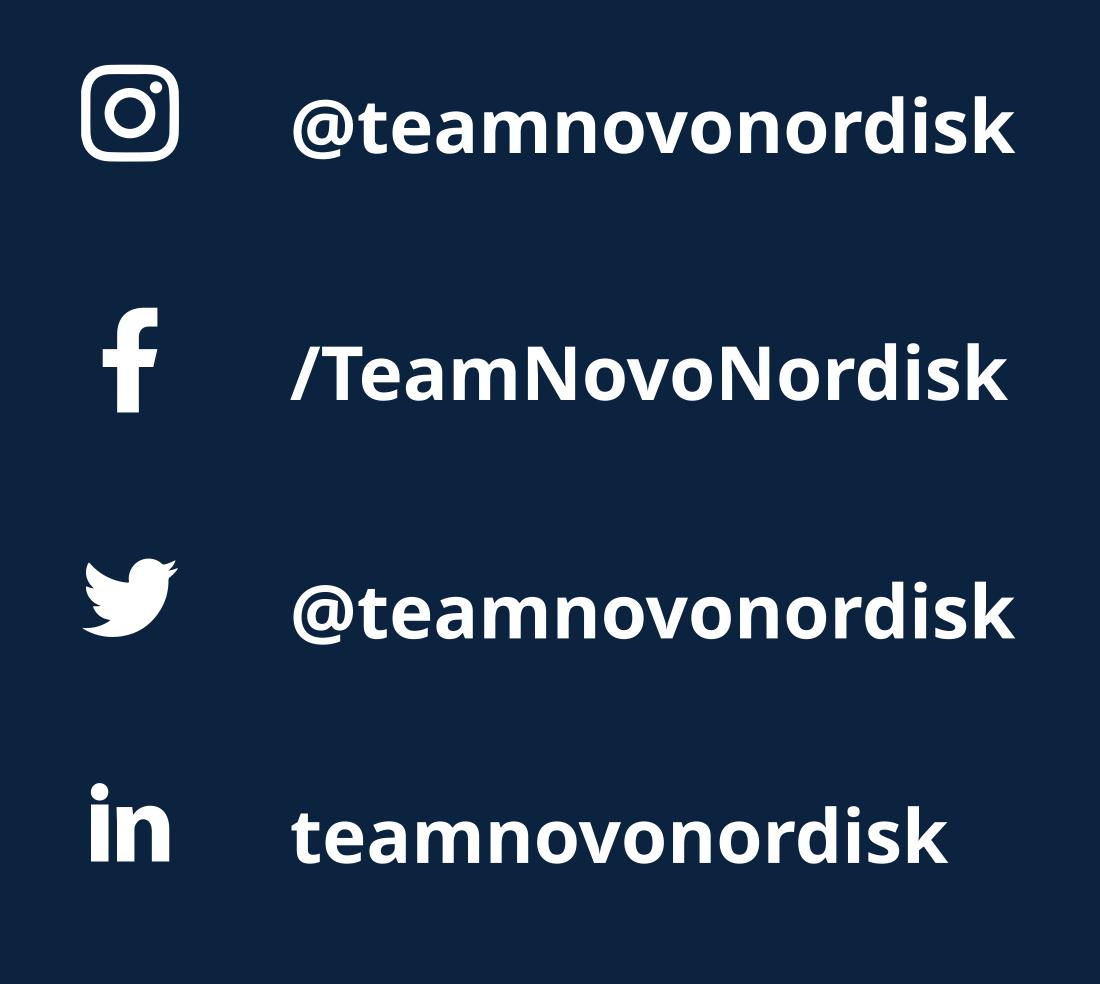
### SAM SCOTT HEAD OF RESEARCH FOR TEAM NOVO NORDISK

Learn more about the Team Novo Nordisk tips and strategies suggested in this guide by reading Type 1 diabetes and pro cycling: 10 years of learning from the professionals **here**.

The Team Novo Nordisk Research Group is made up of scientists and medical professionals with a passion for developing and using evidence-based research to help people living with diabetes to push the boundaries of what is possible. Through the innovative use of medical technology, it is able to gather data and explore what may be possible for athletes living with diabetes.

### teamnovonordisk.com/research

## Follow the team



## www.teamnovonordisk.com



