GLYCAEMIC PROFILE OF PROFESSIONAL CYCLISTS WITH TYPE 1 DIABETES OVER A 7-DAY UCI-WORLD CYCLE TOUR

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Introduction

- Professional road cycling is one of the most demanding endurance sports
- Type 1 diabetes (T1D) presents considerable glycaemic control challenges around exercise
- Team Novo Nordisk (TNN) are a professional continental cycle team that compete in elite-level races while living with T1D

Aim

To examine factors related to glycaemia and performance in TNN over a 7-day UCI-world tour.

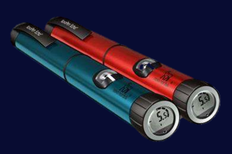
Methods

Table 1. Six professional cyclists with T1D from TNN, all on multiple daily injections, were observed during the Tour of California.

Characteristic	Values	Range
Age (years)	29 ± 3	25 – 34
Duration of T1D (yrs)	13 ± 7	0.75 – 18.5
Body mass (kg)	70.0 ± 5.3	61.5 – 75.5
HbA_{1c} (%)	6.4 ± 0.6	5.7 – 7.3
BMI (kg·min^{-2})	21.3 ± 1.2	19.2 – 22.4
$\dot{V}O_{2max}$ (ml·kg·min^{-1})	72.2 ± 5.0	67.0 – 78.7
Peak power (W)	426.0 ± 36.3	370 – 466

BMI = body mass index; data presented as mean ± SD

Time spent in pre-specified glycaemic ranges was assessed in-ride and subsequent nocturnal periods (22:00-06:00) using Dexcom G6.



Insulin dosage and timing was recorded using NovoPen® Echo Plus (Novo Nordisk, Bagsværd, Denmark) smart insulin pens.

Participants performed all races with a mobile power-meter to monitor power output, cadence, temperature, speed, distance, duration, elevation and energy expenditure.

In-ride nutrition was quantified during the races.

- Number of stages: 7
- Total distance: 1,244 km
- Total elevation: 20,840 m
- Pro teams: 18

Figure 1. Overview of the Tour of California

Results

- Six TNN riders completed the Tour of California, covering 1,244 km, with a total elevation of 20,840 m over 7 consecutive days.
- Bolus insulin use was uncommon during races, even with considerable in-ride carbohydrate intake.
- Average in-ride carbohydrate intake (76 ± 23 g·h^{-1}) in the TNN cyclists are in line with contemporary nutrition guidelines.
- The TNN riders spent a high proportion of time in target glycaemic range (63±11%) during the races (Fig 3A).
- Of concern is the progressively greater hypoglycaemia during the nocturnal periods over the Tour (Fig 3B).

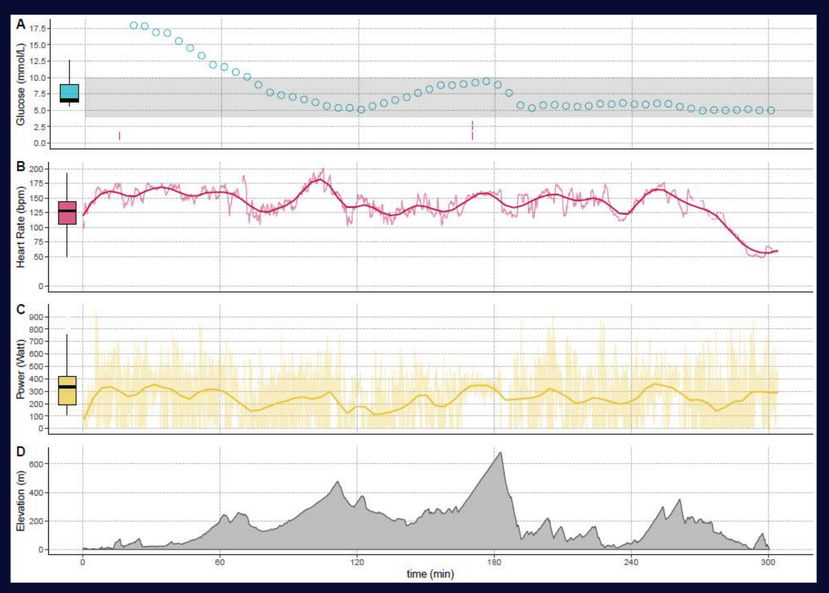


Figure 2. Representative plot of in-ride data collected during the Tour of California Panel A shows continuous glucose monitoring data (Dexcom G6) The grey shading underneath the data indicates target glycaemic range (3.9-10.0 mmol/L). Panel B shows heart rate with a moving average curve overlaid to the raw data (red line). Panel C shows raw power output with normalised power displayed as the yellow line. Panel D shows elevation over the course of the stage. Box whisker plots are shown in Panels A-C displaying the median along with the inter-quartile range.

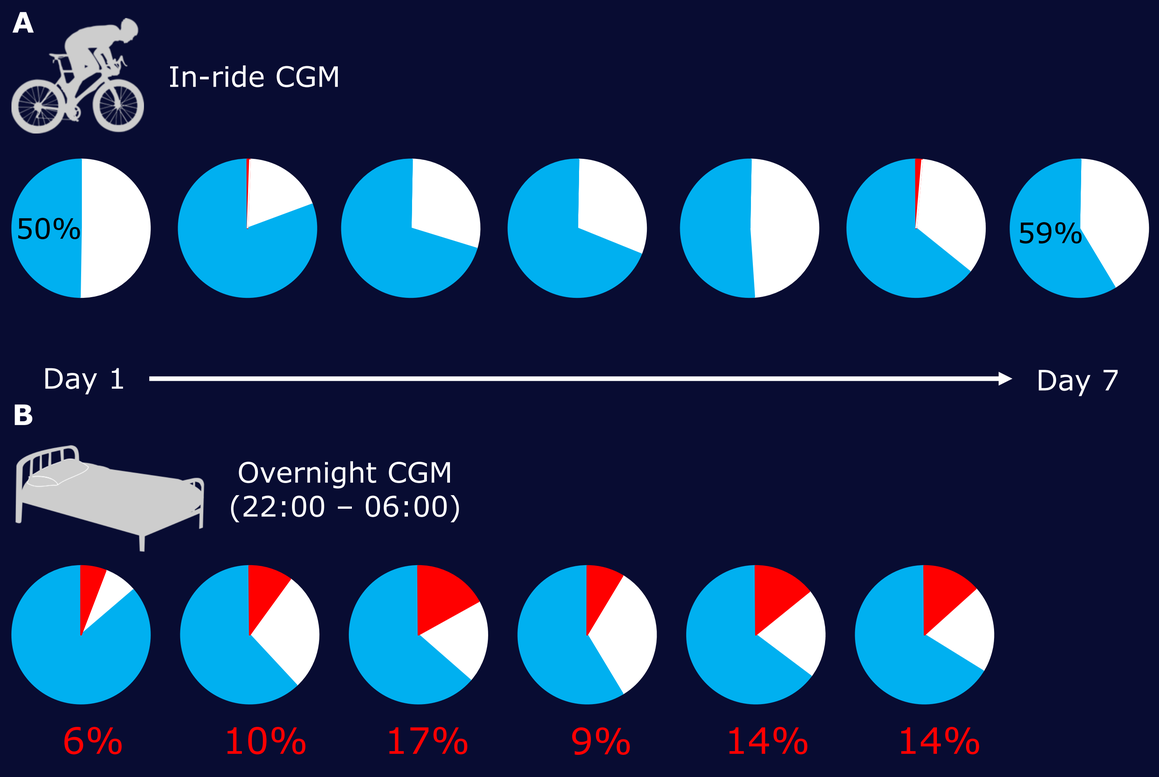


Figure 3. Percentage of time in glycaemic ranges over the Tour of California for all of the riders
Relative percentage of time in different glucose ranges (euglycaemia in blue (4-10 mmol/L); hypoglycaemia in red (<3.9 mmol/L); hyperglycaemia in blue (>10 mmol/L). Panel A shows the continuous glucose monitor (CGM) data for during the races and Panel B shows the nocturnal period which is defined as 22:00-06:00 h.

Conclusions

- We provide novel insights into practices of professional athletes with T1D.
- The TNN riders spent a high proportion of time in target glycaemic range over a 7-day stage race.
- Greater understanding of post race nutrition and hypoglycaemia during recovery is needed.

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