Using HbA1c to Diagnose Diabetes in the UC, Davis-Type 2 Diabetes Mellitus Rat Model

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ABSTRACT

With disease progression, type 2 diabetes mellitus (T2DM) leads to debilitating complications arising from damage to nerves and blood vessels. Importantly, investigations focusing on T2DM progression have the capacity to distinguish individuals at greater risk for these severe complications through the identification of predictive biomarkers. Hence, the accurate diagnosis of T2DM is critical to such investigations. UC Davis (UCD) T2DM rats are born without diabetes and develop the disease over time with a similar pathophysiology to that in humans. This unique rat model allows researchers to investigate predictive biomarkers linked to the progression of T2D; however, such investigations require an accurate diagnosis of T2DM onset. **PURPOSE:** To determine the most accurate measure to diagnose T2DM using UCD-T2DM rats. **METHODS:** 10 male UCD-T2DM rats were used in this study. Glucose and HbA1c were measured weekly from the tail beginning at 16 wks of age (before onset) and continuing until 25 wks of age (all rats had become diabetic). These measures were taken under both fasted (8 hrs) and random conditions as well as in the morning (AM) and afternoon (PM). A two-way repeated measures ANOVA was run with condition [fasted (FG) vs random (RG)] and time (AM vs PM) as factors, followed by Holm Sidak post hoc analyses. In addition, growth curves were fit to the data for all rats to estimate the trajectories of RG and HbA1c. **RESULTS:** We found that RG was more variable compared to FG (FG: 116±46 vs RG: 216±94 mg/dL; n=10). However, HbA1c was stable across both conditions (fasted HbA1c: 6.0±0.8 vs random HbA1c: 6.0±1.0%; n=10). In addition, both FG and RG morning levels were significantly lower compared to afternoon (FG AM: 99±6 vs FG PM: 133±19 mg/dL; n=10; $p<0.01$ & RG AM: 199±27 vs RG PM: 234±32 mg/dL; n=10; $p<0.01$). However, there was no difference between morning and afternoon HbA1c values for either condition ($p>0.05$). In addition, the location on the growth curve where RG crossed 200 mg/dL (currently the most common diagnostic criteria used) corresponded to a HbA1c of 5.6%. **CONCLUSION:** A HbA1c of 5.6% may provide a more accurate measure to diagnose the onset of diabetes in the UCD-T2DM rat model.

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