

## Influence of Partial Pressure of Oxygen in Blood Samples on Measurement Performance in Glucose-Oxidase-Based Systems for Self-Monitoring of Blood Glucose

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### Abstract

#### **Background:**

Partial pressure of oxygen ( $pO_2$ ) in blood samples can affect blood glucose (BG) measurements, particularly in systems that employ the glucose oxidase (GOx) enzyme reaction on test strips. In this study, we assessed the impact of different  $pO_2$  values on the performance of five GOx systems and one glucose dehydrogenase (GDH) system. Two of the GOx systems are labeled by the manufacturers to be sensitive to increased blood oxygen content, while the other three GOx systems are not.

#### **Methods:**

Aliquots of 20 venous samples were adjusted to the following  $pO_2$  values:  $<45$ ,  $\sim 70$ , and  $\geq 150$  mmHg. For each system, five consecutive measurements on each sample aliquot were performed using the same test strip lot. Relative differences between the mean BG results at  $pO_2 \sim 70$  mmHg, which is considered to be similar to  $pO_2$  in capillary blood samples, and the mean BG result at  $pO_2 < 45$  and  $\geq 150$  mmHg were calculated.

#### **Results:**

For all tested GOx systems, mean relative differences in the BG measurement results were between 6.1% and 22.6% at  $pO_2 < 45$  mmHg and between -7.9% and -14.9% at  $pO_2 \geq 150$  mmHg. For both  $pO_2$  levels, relative differences of all tested GOx systems were significant ( $p < .0001$ ). The GDH system showed mean relative differences of -1.0% and -0.4% at  $pO_2$  values  $< 45$  and  $\geq 150$  mmHg, respectively, which were not significant.

#### **Conclusions:**

These data suggest that capillary blood  $pO_2$  variations lead to clinically relevant BG measurement deviations in GOx systems, even in GOx systems that are not labeled as being oxygen sensitive.

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**Abbreviations:** (BG) blood glucose, (GDH) glucose dehydrogenase, (GOx) glucose oxidase, (ISO) International Organizations for Standardization, ( $pO_2$ ) partial pressure of oxygen, (SMBG) self-monitoring of blood glucose

**Keywords:** blood glucose monitoring systems, glucose dehydrogenase, glucose oxidase, partial pressure of oxygen, self-monitoring of blood glucose

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