
Performance of Precision G Blood Glucose Analyzer with a New Test Strip G2b on Neonatal Samples, Burcu Meric,¹ Nazife Kilicaslan,² Kagan Kerman,¹ Dilsat Ozkan,¹ Umran Kurun,³ Nejat Aksu,³ and Mehmet Ozsoz¹*¹ Department of Analytical Chemistry, Faculty of Pharmacy, Ege University, 35100 Bornova, Izmir, Turkey; Departments of ²Biochemistry and ³Neonatal Unit, Izmir Social Security Institution Tepecik Educational Hospital, 35120 Tepecik, Izmir, Turkey; * author for correspondence: e-mail ozsozs@pharm.ege.edu.tr

In newborns, hypoglycemia must be detected in venous specimens with a wide range of hematocrits and oxygen tensions. The need for a simple and rapid test for glucose to meet special applications such as those found in pediatric wards has been suggested frequently (1–4). Simple tests are available, but their use in neonatal units has usually not been recommended, reflecting, at least in part, the influence on results of sample hematocrit and oxygen tension (5, 6).

The Precision G System is a new instrument with a new electrode strip (G2b), which is purported to address many of the shortcomings found in previous generations of biosensors. The bioactive component of Precision G System is glucose oxidase. This is also used in many other glucose measuring systems (7). The component that makes the Precision G System unique is the signal transducer and mediator ferrocene (8).

We performed laboratory and clinical evaluations of the Precision G System with the G2b test strips to determine its suitability for use in a neonatal unit. We compared the performance of the Precision G System with a laboratory method using venous specimens with a wide range of hematocrits taken from patients in a neonatal intensive care unit.

After approval from the Institutional Review Board of the Izmir Social Security Institute (SSK) Tepecik Education Hospital, the instrument was permitted to be used in the neonatal unit of the hospital. After informed consent was received from the parents, 3.5 μL of the 1.5-mL venous blood samples, taken for the necessary routine biochemical analysis during the treatment period of each neonate, were used for studies described in this report. The samples were kept at room temperature in heparinized tubes before use. The samples were applied to the Precision G System within 5 min after they were taken from the neonates. Venous samples from 100 patients had whole-blood glucose measured on the Precision G System and plasma glucose measured on the Hitachi 911 reference system. The hematocrit of each sample was also measured (Bayer Advia 120 Hematology System).

In the Precision G System, glucose reacts with glucose oxidase on the test strip. The chemical reaction releases electrons, which are transferred from the enzyme to the electrodes by ferricinium+, the oxidized form of the mediator ferrocene. These electrons form a small current. The electrical current, detected by the electrodes on the test strip, is proportional to the concentration of glucose in the specimen. The analysis time is 20 s.

The Precision G test strip contains three electrodes (reference, working, and background compensation electrodes). The background compensation electrode, containing no glucose oxidase, measures the nonspecific current from potentially interfering substances such as ascorbic acid and urea. This background current is subtracted from the current measured on the working electrode.

The Precision G System starts testing when it detects that a sample has been applied to the test strip. If the test fails to start because of an insufficient sample amount, the user may apply a second drop of blood to the same test strip within 30 s.

Unlike photometric (reflectance) analyzers, blood does not enter the sensor during testing with the Precision G System. Each Precision G2b is sealed in an individual foil packet, which has a barcode on the exterior. The barcode contains lot-specific information, including calibration

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**Fig. 1.** Linear regression of 100 blood-glucose measurements with the Hitachi 911 reference system and the Precision G System with the G2b.
data. To perform a test, the system reads the barcode on the test strip, thus calibrating the sensor for that specific lot of test strips. The test strip is then inserted into the system. To avoid loss of glucose from glycolysis, fresh venous blood from the neonates must be measured immediately by the Precision G system, and the samples were analyzed by the Precision G system and the Nova Stat Profile 9 Blood Gas Analyzer at the same time in triplicate. The 

### Table 1. Effect of oxygen on Precision G System results.

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| PO2, mmHg | Measured glucose, mmol/L | 
| 30° | 2.5 | 4.0 | 15.3 |
| 70 | 2.3 | 3.8 | 14.7 |
| 250 | 2.3 | 3.7 | 14.3 |
| 380 | 2.2 | 3.6 | 13.9 |
| RSD, % | 5.4 | 4.6 | 4.2 |

Values are the means of triplicate determinations. The PO2 in the collected samples. RSD, relative SD.

Each of the three new samples was further divided into three heparinized tubes. These tubes were put in a closed chamber and exposed to oxygen for 1, 3, and 5 min, respectively, and the samples were analyzed by the Precision G system and the Nova Stat Profile 9 Blood Gas Analyzer at the same time in triplicate. The PO2 did not affect measured glucose (Table 1).

The most commonly observed PO2 in neonates is 50–70 mmHg; PO2 >150 mmHg can be found only in patients receiving oxygen therapy (10). In our oxygen sensitivity assessment, the oxygen tension was examined in a wide range from 70 to 380 mmHg to verify the applicability of Precision G system.

The data appear to corroborate the manufacturer's claims that this new biosensor test strip represents an advance over previous generations of whole-blood glucose sensors. The effect of sample oxygen tension on this test strip appears negligible, whereas the effect of sample hematocrit is substantially less than with earlier strips (11, 12). These features are advantages of the Precision G System for neonatal use.

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References


