Glycohemoglobin Results in Samples with C or S Trait Measured on the Bio-Rad Diamat and Variant Express

To the Editor:

We read with interest the report on glycohemoglobin results in samples with hemoglobin (Hb) C or S trait by Roberts et al. (1). We recently evaluated another system for measuring HbA1c, the Bio-Rad Variant Express (Bio-Rad Laboratories). HbA1c values (%) in blood from 34 presumed diabetic patients were generated using the Variant Express and compared with values from the Bio-Rad MDMS HPLC system with the Diamat reagents and assay program. HbA1c values for the study group were 4.5–16.0%, with a mean of 10.8%. Of the 34 patient samples, 26 were homozygous for hemoglobin A (HbAA), 5 were sickle cell trait (HbAS), and 3 were C trait (HbAC).

The HbA1c values for HbAA patients were in agreement when measured on both systems (P = 0.688, paired t-test). The results obtained for the HbAS group on the Variant Express were significantly increased (P = 0.003). For the HbAC group, the results obtained with the Variant Express were higher, but the small sample size hindered realistic statistical analysis (Table 1).

The Diamat HbA1c values of two HbAS patients and one HbAC patient placed them in the “near normal glycemia” (6–7%) category of glucose control. When HbA1c for these same three patients was measured with the Variant Express, they fell into “action suggested” (>8%).

The Diamat may be underestimating the true HbA1c values in HbAS and HbAC samples. It calculates HbA1c (%) using total HbA derived through integration of the HPLC chromatogram and assumes that an accurate assessment of HbA is obtained in the presence of HbS and HbC. The Variant Express uses boronate affinity for separation of glycated from non-glycohemoglobins. Its results rely on the premise that hemoglobin genetic variants, Hbs and Hbc being common examples, glycate similarly to HbA and that the mean survival times of the erythrocytes in these patients are similar to that seen in homozygous A individuals. Therefore, measurement of total glycohemoglobin can be used to estimate the percentage of HbA1c provided appropriate calibrators are used. Calibrators for the Variant Express have standardized HbA1c values assigned against Diamat HbA1c, and results can be reported as a standardized percentage of HbA1c. Values for total glycohemoglobin are also generated by the Variant Express.

To address the issue of which system, the Diamat or Variant Express, generates HbA1c values that more accurately reflect the state of glycemic control in AS or AC patients, one might correlate results with mean blood glucose (2) values. Unfortunately, these were not available.

Although the discussion presented here is based on a small number of patient samples, it reinforces the concept presented by Roberts et al. (1) that it is important to assess the effects of HbAC, HbAS, and other hemoglobin variants on the various technologies and methodologies for measurement of HbA1c.

Table 1. Correlation, mean, range, and mean differences of pairs of results for samples measured on the Variant Express and Diamat.

<table>
<thead>
<tr>
<th>Hb</th>
<th>n</th>
<th>r*</th>
<th>Variant Express mean (absolute range)</th>
<th>Mean differences of pairs</th>
</tr>
</thead>
<tbody>
<tr>
<td>HbA1c</td>
<td></td>
<td></td>
<td>Diamat mean (absolute range)</td>
<td></td>
</tr>
<tr>
<td>AA</td>
<td>26</td>
<td>0.94</td>
<td>12.15 (10.1–16.4)</td>
<td>12.19 (10.0–16.4)</td>
</tr>
<tr>
<td>AS</td>
<td>5</td>
<td>0.94</td>
<td>6.4 (4.5–8.8)</td>
<td>8.5 (7.1–12.5)</td>
</tr>
<tr>
<td>AC</td>
<td>3</td>
<td>0.99</td>
<td>7.1 (5.5–9.6)</td>
<td>10.3 (7.4–15.1)</td>
</tr>
</tbody>
</table>

*Pearson correlation.

References


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