Stability of Plasma Glucose in Whole Blood Samples Collected in Sodium Fluoride Tube vs. Sodium Heparin Plasma Separator Tubes

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Background

The concentration of plasma glucose is influenced by preanalytical variables such as delayed processing of whole blood. Glucose concentrations decrease by 5-7% per hour in whole blood due to glycolysis. This preanalytical loss decreases the diagnostic sensitivity of glucose when used to diagnose diabetes mellitus or gestational diabetes mellitus. Sodium fluoride (NaF) is commonly used to inhibit glycolysis in samples collected during oral glucose tolerance tests, but is inadequate as it does not stop glycolysis for two or more hours. Guidelines recommend blood samples be immediately immersed in an ice slurry and analyzed within 30 minutes of collection, but this is difficult to achieve in patient care settings. The objective of this study was to identify preferred processing methods for the preservation of glucose when samples are collected for oral glucose tolerance and postprandial glucose testing.

Methods

1 mL aliquots transferred to pre-labeled aliquot tubes with centrifugation times

Three tubes stored at ambient temperature

Three tubes stored in ice slurry

Tubes centrifuged at designated times and stored at 4°C until testing

All samples tested in duplicate via the same Dimension Vista Chemistry Analyzer

Results

Table 1. Mean glucose concentrations from samples collected into NaF tubes or sodium heparin plasma separator tubes and stored at various temperatures and times.

<table>
<thead>
<tr>
<th>Time from collection (minutes)</th>
<th>Sodium Fluoride (ambient)</th>
<th>Sodium Heparin (ambient)</th>
<th>Sodium Heparin (ice slurry)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Subject 1</td>
<td>94</td>
<td>104</td>
<td>86</td>
</tr>
<tr>
<td>Subject 2</td>
<td>104</td>
<td>113</td>
<td>102</td>
</tr>
<tr>
<td>Subject 3</td>
<td>133</td>
<td>73</td>
<td>125</td>
</tr>
<tr>
<td>Subject 1</td>
<td>73</td>
<td>105</td>
<td>81</td>
</tr>
<tr>
<td>Subject 2</td>
<td>130</td>
<td>130</td>
<td>128</td>
</tr>
<tr>
<td>Subject 3</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Excluded from analysis.</td>
<td>NA</td>
<td>NA</td>
<td>NA</td>
</tr>
</tbody>
</table>

Sodium Fluoride

Sodium Heparin (Gel Separator Tube)

1 mL aliquots transferred to pre-labeled aliquot tubes with centrifugation times

1 mL aliquots centrifuged at designated times, plasma removed, and stored at 4°C until testing

All samples tested in duplicate via the same Dimension Vista Chemistry Analyzer

Three tubes stored in ice slurry

Three tubes stored at ambient temperature

Absolute Glucose Difference (mg/dL)

0 1 2 3 4 5 6 7 8 9 10 11 12

Sodium Fluoride (ambient)

Sodium Heparin (ice slurry)

Sodium Heparin (ambient)

Conclusion

The decrease in glucose exceeded the allowable error 120 minutes after collection in NaF tubes. While glucose decreased in samples collected in sodium-heparin tubes, the allowable error was never exceeded in samples stored at ambient temperature or on ice. Whole blood collected into plasma separator tubes and processed within 60 minutes yields acceptable glucose results for oral glucose tolerance testing.