K960084

SUMMARY OF 510(K) SAFETY AND EFFECTIVENESS INFORMATION

This summary of 510(k) safety and effectiveness information is being submitted in accordance with the requirements of SMDA 1990 and 21 CFR 807.92.

HiChem Glucose/HK Reagent (product no. 70007) is for the quantitative determination of glucose in serum, plasma, cerebrospinal fluid and urine. The most common causes of abnormal glucose levels are diabetes, liver disease, and certain endocrine disorders.

The HiChem Glucose/HK Reagent determines glucose by enzymatic phosphorylation using ATP in the presence of hexokinase. The extent of this reaction, and the quantity of glucose in the specimen, is determined through the measurement of the resulting glucose-6-phosphate by producing NADH in the presence of glucose-6-phosphate dehydrogenase.

The HiChem Glucose Reagent is intended to be used either as a manual procedure or on clinical analyzers which can automate the required manipulations. The reagent is supplied as two liquid-stable components which are combined, either before or during use, in the approximate ratio of 1 part Glucose Enzyme Reagent and 8 parts Glucose Reagent Buffer. The Glucose Enzyme Reagent can also be used as a start reagent and combined with the Reagent Buffer following sample addition.

The HiChem Glucose/HK Reagent calibrated with the HiChem Chemistry Standard, product 70023 is substantially equivalent to the BMD Glucose/HK Reagent, product no. 704035 calibrated with Precical Calibrator Serum and Diluent, product no. 620213, both manufactured by Boehringer Mannheim Corp., Indianapolis, IN. and the Sigma Glucose (HK) Reagent, procedure no. 16-UV calibrated with Glucose/Urea Nitrogen Standard, product no. 16-300, both manufactured by Sigma Diagnostics, St. Louis, MO. Substantial equivalence between the HiChem and the other calibrators for the purpose of calibrating urea nitrogen methods is also shown. All three reagent/calibrator pairs support the same intended use (with the exception of the specimen limitations for the Sigma reagent) and produce equivalent results with the same clinical purpose. In addition, they are all based on the same methodology which determines glucose through the measurement of NADH production. Finally, all reagents are sold in a generic format with their use on various instruments supported through procedure supplements (application sheets).

The effectiveness of the manual procedure is shown by the recovery of linearity standards, the precision of control recoveries, a comparison of serum and plasma recoveries to the Sigma Glucose (HK) Reagent, a comparison of urine and CSF recoveries to the BMD Glucose/HK Reagent and validation of the chemical additive and reconstituted stability claims.

The recovery of glucose using HiChem Glucose/HK Reagent as a manual method is linear to at least 500 mg/dL as shown by the recovery of linearity standards which span the claimed linear range. Regression statistics are shown below.

(HiChem Results) = 2.1 mg/dL + 0.9769 × (Standard Value), $r = 0.9999$, $s_{y.x} = 2.6$ mg/dL.

Precision, demonstrated by replicate assay of commercially available control sera and urine pools, is shown below.

Specimen	n	mean	within run SD	total SD
Low serum control	30	95.6 mg/dL	0.89 mg/dL	2.77 mg/dL
High serum control	30	296.1 mg/dL	2.78 mg/dL	4.41 mg/dL
Low urine pool	30	18.7 mg/dL	0.75 mg/dL	1.50 mg/dL
High urine pool	30	274.2 mg/dL	2.10 mg/dL	6.95 mg/dL
Low CSF control	30	59.8 mg/dL	0.78 mg/dL	2.9 mg/dL
High CSF control	30	41.9 mg/dL	1.11 mg/dL	2.8 mg/dL

Glucose recoveries of 80 mixed serum and plasma specimens are compared between the HiChem and Sigma reagents. Glucose recoveries of 36 spiked urine specimens and 37 CSF specimens are compared between the

HiChem
231 North Puente Street, Brea, California 92621
Telephone: (714) 871-8360 / (800) 422-3526 / Fax: (714) 871-2439

HiChem Glucose/HK Reagent and the BMD Glucose/HK Reagent used on the Hitachi 704. All reagents were calibrated with their recommended calibrators. Least squares regression statistics are shown below.

Serum/Plasma Comparison
(HiChem Results) = 0.2 mg/dL + 1.013 x (Sigma Results) r = 0.999, $s_{y.x}$ = 2.3 mg/dL.

Urine Comparison
(HiChem Results) = 4.1 mg/dL + 0.944 x (BMD Results) r = 0.998, $s_{y.x}$ = 5.58 mg/dL.

CSF Comparison
(HiChem Results) = 1.9 mg/dL + 0.972 x (BMD Results) r = 0.997, $s_{y.x}$ = 1.8 mg/dL.

The use of heparin, EDTA, fluoride, oxalate and iodoacetate are shown to be acceptable chemical additives by comparison of spiked and unspiked serum pools. In all cases, the biases observed were less than 2 mg/dL.

The stability of the combined working reagent over 3 months at 2-8°C and 10 days at 18-25°C are documented through the recovery of serum controls and linearity standards which span the claimed linear range of the method. In all cases, the observed shifts in standard recovery were less than 1.8%.

The effectiveness of the automated Hitachi 704 procedure is shown by the recovery of linearity standards, the precision of control recoveries, comparison of patient specimen recoveries to the BMD Glucose/HK Reagent and the recovery of serum controls over the claimed calibration stability period.

The recovery of glucose using HiChem Glucose/HK Reagent as an automated method is linear to at least 1000 mg/dL as shown by the recovery of linearity standards which span the claimed linear range. Regression statistics are shown below.

(HiChem Results) = 1.4 mg/dL + 0.986 x (Standard Value), r = 1.0000, $s_{y.x}$ = 2.7 mg/dL.

Precision, demonstrated by replicate assay of commercially available control sera and urine pools, is shown below.

Specimen	n	mean	within run SD	total SD
Low serum control	60	86.5 mg/dL	0.68 mg/dL	1.07 mg/dL
Mid. serum control	60	294.0 mg/dL	1.18 mg/dL	2.09 mg/dL
High serum control	60	577.5 mg/dL	2.18 mg/dL	5.39 mg/dL
Low urine pool	60	23.5 mg/dL	0.67 mg/dL	0.77 mg/dL
High urine pool	60	669.5 mg/dL	2.41 mg/dL	4.88 mg/dL
Low CSF control	58	33.6 mg/dL	1.02 mg/dL	1.13 mg/dL
High CSF control	59	57.2 mg/dL	0.78 mg/dL	1.26 mg/dL

Glucose recoveries of 105 mixed serum and plasma specimens, 56 spiked urine specimens and 40 CSF specimens, compared between the HiChem and BMD reagents using least squares regression, yield the following statistics.

Serum/Plasma Comparison
(HiChem Results) = -1.1 mg/dL + 1.004 x (BMD Results) r = 0.999 , $s_{y.x}$ = 1.61 mg/dL.

Urine Comparison
(HiChem Results) = -1.4 mg/dL + 0.989 x (BMD Results) r = 0.999, $s_{y.x}$ = 3.3 mg/dL.

CSF Comparison
(HiChem Results) = 0.1 mg/dL + 0.978 x (BMD Results) r = 0.999 , $s_{y.x}$ = 1.1 mg/dL.

The calibration stability claim of one month is documented through the recovery of serum controls which span from 43 to 570 mg/dL glucose. In all cases, the observed shifts in recoveries over 47 days without calibration are less than the greater of 2 mg/dL or 2%.

The HiChem Glucose/HK Reagent, calibrated with the HiChem Chemistry Standard, is shown to be safe and effective and substantially equivalent to the Sigma Glucose (HK) Reagent, procedure no. 16-UV, calibrated with Sigma Glucose/Urea Nitrogen Standard, product no. 16-300 and the BMD Glucose/HK Reagent, product no. 857429, calibrated with Precical Calibrator Serum and Diluent, product no. 620213.

Wynn Stocking
Regulatory Affairs Manager