510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY AND INSTRUMENT COMBINATION TEMPLATE

A. 510(k) Number:

k153692

B. Purpose for Submission:

Adding previously cleared test on a new instrument platform

C. Measurand:

Glucose

D. Type of Test:

Quantitative, photometric

E. Applicant:

Infrared Laboratory Systems, LLC (DBA Synermed)

F. Proprietary and Established Names:

Synermed Glucose Reagent
Synermed IR-1200 Chemistry Analyzer

G. Regulatory Information:

Product Code	Classification	Regulation Section	Panel
CGA	II	862.1345, Glucose Test System	Chemistry (75)
JJE	I, exempt	862.2160, analyzer, chemistry (photometric, discrete) for clinical use	Chemistry (75)

H. Intended Use:

1. Intended use(s):

The Synermed Glucose Reagent is for the in vitro quantitative measurement of glucose in serum on the Synermed IR-1200. Glucose measurements are used in the diagnosis and treatment of carbohydrate metabolism disorders including diabetes mellitus, neonatal hypoglycemia, and of pancreatic islet cell carcinoma.

The Synermed IR-1200 analyzer is intended for in vitro diagnostic use as a multiparameter chemistry instrument that quantitates the levels of constituents in serum. The analyzer is an automated, random access, computer controlled, clinical chemistry analyzer for clinical chemistry tests. The instrument provides in vitro quantitative measurements for glucose in serum. The device is intended for use only in clinical laboratories.

2. Indication(s) for use:

   See intended use above.

3. Special conditions for use statement(s):

   For prescription use only.

4. Special instrument requirements:

   Synermed IR-1200 Chemistry Analyzer

I. Device Description:

Clinical laboratories can use the Synermed IR-1200 chemistry analyzer for in vitro diagnostic testing. The analyzer consists of a carousel system for reagents and samples, an internal cooling unit, a sampling/dispensing arm assembly, an incubation assembly, and a wash station. The analyzer is controlled by software using a Windows operating system and dedicated applications software. The Synermed IR-1200 analyzer includes a heater to provide 37 degree reaction temperatures. The IR-1200 also keeps reagents cold during storage using a semiconductor. The IR-1200 chemistry analyzer measures 51in × 34in × 44 in (L×W×H) and weighs 750 lbs.

The Infrared Laboratory Systems' Synermed IR-1200 Chemistry Analyzer uses the previously-cleared Synermed Glucose Reagent kit for spectrophotometric analysis of glucose in serum. The analyzer automatically combines the sample with the reagent(s), mixes, incubates the mixture, measures the absorbance of the chromophore, and calculates the concentration of the analyte. After analysis, the cuvettes are automatically washed and dried prior to the next use.

The Synermed Glucose reagent include liquid ready to use reagents, R1 and R2. The reagent composition consists of the glucose chromogen, 280 umol/L N-sulfopropyl-N-ethyl-3,5-dimethylaniline, and the glucose reagent, 280 umol/L ampyrose, 1400 U/L peroxidase

(horseradish) and 18,000 U/L glucose oxidase (microbial) in the final reaction mixture.The glucose reagents were previously cleared in k903063.

J. Substantial Equivalence Information:

1. Predicate device name(s):

   Hitachi 717 Chemistry Analyzer
   Synermed Glucose Test System

2. Predicate 510(k) number(s):

   k872494
   k903063

3. Comparison with predicate:

   Analyzer:

Similarities and Differences		
Item	**Candidate Device: Synermed IR-1200 Chemistry Analyzer**	**Predicate Device: Hitachi 717 Chemistry Analyzer (k872494)**
Intended Use	An automated clinical analyzer for in vitro diagnostic use only in clinical laboratories.	Same
Setting	Clinical laboratory use only	Same
Specimen type	Human serum	Same
Power	220 VAC, 50/60 Hz	115 VAC, 60 Hz
Analytical Methods	Endpoint, kinetic	Same
Mode of detection	Photometric	Same
Calibration Methods	Linear and Nonlinear calibration	Same
Throughput (Max)	800 photometric tests/hour	600 photometric tests/hour
Calibration/QC	Programmable Cal/ QC, will repeat automatically if out of range	Same
Photometer wavelength	340-800 (12 wavelengths)	Same
Linear absorbance range	0-3.3 absorbance	0-3.2 absorbance
Reaction Cuvettes	Reusable PMMA (polymethylmethacrylate)	Same
Lightpath	0.5 cm	0.6 cm
Sample Volume	1.5-35 µL	1-20 µL
Reagent Volume	15-350 µL	50-350 µL
Reaction Volume	120-450 µL	250-400 µL

Glucose reagent:

Similarities and Differences		
Item	**Candidate Device: Synermed Glucose Test System**	**Predicate Device: Synermed Glucose Test System (k903063)**
Intended Use	For the quantitative measurement of glucose in serum	Same
Test Principle or Method	Glucose oxidase	Same
Sample Type	Serum	Serum, plasma
Measuring Range	8-885 mg/dL	0-900 mg/dL
Instrument use for	Synermed IR-1200 analyzer	Hitachi 717 analyzer

K. Standard/Guidance Document Referenced (if applicable):

CLSI EP6-A Evaluatoin of the Linearity of Quantitative Measurement Procedures: A Statistical Approach

CLSI EP07-A2 Interference Testing in Clinical Chemistry

CLSI EP09-A3 Measurement Procedure Comparison and Bias Estimation Using Patient Samples

CLSI EP10-A3-AMD Preliminary Evaluation of Quantitative Clinical Laboratory Measurement Procedures

CLSI EP15-A3 User Verifications of Precision and Estimation of Bias

CLSI EP17-A2 Evaluation of Detection Capability for Clincial Laboratory Measurement

L. Test Principle:

The glucose measurement is based on the enzymatic reaction of glucose with glucose oxidase. Glucose oxidase catalyzes the conversion of glucose to gluconolactone, which then forms gluconic acid and hydrogen peroxide. The hydrogen peroxide reacts with N-sulfopropyl-N-ethyl-3, 5-dimethylaniline and ampyrone in the presence of peroxidase to form a blue azo dye, which is quantitated at 650-660 nm.

M. Performance Characteristics (if/when applicable):

1. <u>Analytical performance:</u>

   a. Precision/Reproducibility:

A precision study was conducted on the Synermed IR-1200 by measuring five levels of human serum pools for glucose (45, 120, 180, 375, and 625 mg/dL). Each sample was run in duplicate twice a day for twenty days for a total of 80 measurements for each analyte. The mean, standard deviation and coefficient of variation were determined for glucose at all control levels. Precision results are summarized in the table below.

	Within Run Precision		Total Precision	
Mean (mg/dL glucose)	S.D. (mg/dL)	C.V. (%)	S.D. (mg/dL)	C.V. (%)
44.6	0.25	0.5%	0.5	1.2%
120.7	1.35	1.1%	1.7	1.4%
180.8	1.74	0.9%	2.1	1.1%
375.2	0.6	0.1%	0.8	0.2%
626.03	0.6	0.09%	0.8	0.1%

b. Linearity/assay reportable range:

Linearity studies for glucose were performed on the Synermed IR-1200 chemistry analyzer using eleven different levels of glucose and four replicates at each level. The measurement for the four replicates were averaged and plotted against the expected value. The samples were prepared by mixing high and low pools of human serum. The tested values in the linearity study for glucose were (in mg/dL) 6.5, 24, 33, 45, 120, 180, 275, 375, 476, 576, 672, 780, and 900. Results from the linear regression are summarized in the table below.

Linearity Results

Measurand	Slope	Intercept	R^2	Sample Range Tested	Claimed Measuring Range
Glucose (mg/dL)	0.9928	1.3499	0.9999	6.5 – 900	8 – 885

c. Traceability, Stability, Expected values (controls, calibrators, or methods):

Traceability:
The Synermed Glucose Reagent is traceable to NIST 917b.
Stability claims for the SYNERMED GLUCOSE REAGENT is established in the predicate device k903063.

Calibrators:
The sponsor recommends the use of Synermed IR Cal II calibrator for the Synermed Glucose Reagent. The Synermed IR Cal II Calibrator was previously cleared in k940571.

d. Detection limit:

The Synermed Glucose measurement procedure was evaluated for detection limits according to CLSI document EP17-A2. The Limit of Blank (LoB) study was performed using blank pools prepared from 5 human serum samples treated with glucose oxidase. Two different pools were measured 30 times over two days on the IR-122 Chemistry Analyzer using two lots of reagent, resulting in 120 samples. LoB was determined to be 2.8 mg/dL.

The Limit of Detection (LoD) study was performed using a pool of serum samples with an expected concentration of 4.5 mg/dL. The pool of serum samples were measured 30 times in over two days on the IR-122 Chemistry Analyzer using one two lots of reagent, resulting in 120 samples in two separate studies (n=60 in each study). LoD was determined to be 3.65 mg/dL.

The Limit of Quantitation (LoQ) study was performed using a pool of 5 human serum samples containing a low concentration of glucose greater than the LoD but not greater than 4x the LoB. The serum pool was measured 30 times in over two days on the IR-122 Chemistry Analyzer using one two lots of reagent, resulting in 120 samples in two separate studies (n=60 in each study). The LoQ was determined to be 6.5 mg/dL.

The claimed measuring range of the glucose assay is 8 to 885 mg/dL.

e. Analytical specificity:

The Synermed Glucose measurement procedure was evaluated for interference according to CLSI document EP07-A2. Effects of common endogenous substances including conjugated bilirubin (0.76 and 20 mg/dL), unconjugated bilirubin (0.76 and 20mg/dL), hemoglobin (100 and 500 mg/dL), triglycerides (176.99 and 3274.34mg/dL) and uric acid (11.77 and 23.54mg/dL) were evaluated at two different glucose concentrations (80 mg/dL and 120 mg/dL) for interference. Furthermore, the following exogenous substances: ascorbic acid (1.22 and 6.02mg/dL), acetaminophen (20.11 and 200.18µg/mL), genatmicin (7.51 and 10.05µg/mL), ibuprofen (40.08 and 500.21µg/mL), L-dopa (0.41 and 1.24µg/ml/L), methyldopa (4.24 and 14.99µg/mL), N-acetylcysteine (0.08 and 0.25mg/dL), ofloxacin (8.78 and 17.5mg/L), salicyluric acid 0.2 and 0.6µg/mL), tetracycline (3.78 and 16.27µg.mL) were evaluated at two different glucose concentrations (80 mg/dL and 120 mg/dL) for interference. The sponsor defined non-significant interference when the bias between the tested and control samples are within ±9.99%.

No interference was seen when testing conjugated and unconjugated bilirubin, hemoglobin, triglycerides, acetaminophen, gentamicin, ibuprofen, L-dopa, N-acetylcisteine, and tetracycline at either level of interferent concentration.

However, significant interference was observed and additional dose response study was performed to determine the level and bias of the significant interference substance. The following substances had significant interference with the assay and results for the non-significant concentration and significant concentration are summarized in the tables below.

Interfering Substance	Highest Tested Concentration of Substance without Significant Interference at Glucose Concentration = 80 mg/dL	Highest Tested Concentration of Substance without Significant Interference at Glucose Concentration = 1200 mg/dL
Ascorbic Acid	4.82 mg/dL	4.82 mg/dL
Methyldopa	12.31 ug/mL	12.31 ug/mL
Ofloxacin	8.78 mg/L	8.78 mg/L
Salicyluric Acid	0.5 ug/mL	0.6 ug/mL
Uric Acid	20.6 mg/dL	20.6 mg/dL

Interferent	Interferent Concentration	% Bias seen at Glucose 80mg/dL	% Bias seen at Glucose 120mg/dL
Ascorbic Acid	6.02mg/dL	-11.7	-13.0
Methyldopa	14.99ug/mL	-10	-11.1
Salicyluric Acid	0.6ug/mL	-13.7	-8.7 *not significant
Uric Acid	23.54mg/dL	-10.7	-11.5

f. Assay cut-off:

Not applicable.

2. Comparison studies:

a. Method comparison with predicate device:

Method comparison was performed according to CLSI EP9-A3, 115 samples for glucose were tested using the candidate device on the Synermed IR-1200 and Hitachi 717 chemistry analyzers. Some altered samples were included in this study to cover the range of the assay. The study results are summarized in the table below:

Analyte	Units	Sample Type	Concentration Range Tested	N	Slope	Intercept	R^2
Glucose	mg/dL	Serum	15 – 885	115	0.988	-0.178	0.9994

b. Matrix comparison:

Not applicable.

3. Clinical studies:

a. Clinical Sensitivity:

Not applicable.

b. Clinical specificity:

Not applicable.

c. Other clinical supportive data (when a. and b. are not applicable):

Not applicable.

4. Clinical cut-off:

Not applicable.

5. Expected values/Reference range:

Reference Values are provided in the labeling according to literature as follows:

Glucose: 74 – 106 mg/dL

Tietz, N.W. editor, Fundamentals of Clinical Chemistry, 6th edition, W.B. Saunders Co., Philadelphia, 2008.

N. Instrument Name:

Synermed IR-1200 Chemistry Analyzer

O. System Descriptions:

1. Modes of Operation:

Does the applicant's device contain the ability to transmit data to a computer, webserver,

or mobile device?

Yes ____X___ or No _____

Does the applicant's device transmit data to a computer, webserver, or mobile device using wireless transmission?

Yes _____ or No ____X___

2. Software:

   FDA has reviewed applicant's Hazard Analysis and software development processes for this line of product types:

   Yes ___X____ or No _____

3. Specimen Identification:

   Barcode identification of patient samples.

4. Specimen Sampling and Handling:

   Samples are manually placed on in the sample disk rack. Once the samples are tested, they can be manually removed.

5. Calibration:

   The recommended calibrator for glucose is the IR Cal II Calibrator, previously cleared in K940571. Calibration should be performed every 30 days or if quality control material is outside of range. Assay the reference material according to the procdure used for patient samples.

6. Quality Control:

   The sponsor recommends the following in their labeling: "A generally recognized Quality Control program using both high and low control material must be used." This statement is found in the limitations, warnings and disclaimers. The sponsor recommends that the QC material be run daily with the batch runs. The sample carosel has spaces dedicated to calibration and control materials.

P. Other Supportive Instrument Performance Characteristics Data Not Covered In The "Performance Characteristics" Section above:

A carry-over study has been performed and found to be acceptable.

An operating temperature study was performed and demonstrated that the acceptable ambient

operating temperature is between 16 ºC – 30 ºC.

EMC and Electrical Safety Testing were performed and found to be acceptable.

Q. Proposed Labeling:

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

R. Conclusion:

The submitted information in this premarket notification is complete and supports a substantial equivalence decision.