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

A. 510(k) Number:
k103531

B. Purpose for Submission:
The additional clearance of photometric capabilities to an already cleared clinical laboratory analyzer cleared for ISE methods under k040958. A previously cleared glucose reagent (k971467) was used to demonstrate performance for photometry on the instrument.

C. Measurand:
Serum glucose

D. Type of Test:
Quantitative photometric

E. Applicant:
Tokyo Boeki Medisys Inc.

F. Proprietary and Established Names:
Biolis 24i Clinical Chemistry Analyzer

G. Regulatory Information:
1. Regulation section:
   21CFR Sec.- 862.1345-Glucose test system.
   21CFR Sec.- 862.2160 Discrete photometric chemistry analyzer for clinical use.
2. Classification:
   II, I respectively
3. Product code:
   CFR - Hexokinase, Glucose
   JJE - Analyzer, Chemistry (Photometric, Discrete), For Clinical Use
4. Panel:
   Chemistry (75)

H. Intended Use:
1. Intended use(s):
   See indication(s) for use below
2. Indication(s) for use:
   The Biolis 24i Clinical Chemistry Analyzer is a discrete photometric clinical chemistry analyzer. The device is intended to duplicate manual analytical procedures by automating various steps such as pipetting, heating, measuring color intensity, and reporting results. The device is intended to be used with certain materials to measure various analytes of diagnostic interest including

glucose.

The Biolis 24i analyzer with glucose hexokinase assay is intended to measure glucose quantitatively in human serum. Glucose measurements are used in the diagnosis and treatment of carbohydrate metabolism disorders including diabetes mellitus, neonatal hypoglycemia, and idiopathic glycemia, and of the pancreatic isle cell carcinoma.

3. Special conditions for use statement(s):
   Prescription use
4. Special instrument requirements:
   Biolis 24i Clinical Chemistry Analyzer

I. Device Description:

Using photometry, the Biolis 24i instrument measures the glucose concentration in serum by monitoring the change in absorbance at 340 nm. Additionally, the Biolis 24i with optional Ion-Selective Elective module cleared under (k040958) measures the concentration of the electrolytes, sodium, potassium and chloride in serum, using indirect potentiometry. The Biolis 24i Clinical Chemistry Analyzer will also be marketed under the trade names MGC 240 and Prestige 24i.

Reagent: Carolina Liquid Chemistries Glucose Reagent (k971467) packaged for use on the BioLis 24i analyzer contains three 40 mL bottles of GLUC R1 Reagent. GLUC R1 Reagent contains 1.1 mmol/L ATP, 2.7 mmol/L NAD, 2 mmol/L magnesium, >2000 IU/L hexokinase (yeast), >4000 IU/L, G-6-PD (leuconostoc mesenteroides), preservatives and stabilizers.

Calibration is performed using Pointe Chemistry Calibrator (k070207)

J. Substantial Equivalence Information:

1. Predicate device name(s):
   Beckman's CX-7 and Glucose Hexokinase Reagent
2. Predicate 510(k) number(s):
   k904219, k802810 respectively
3. Comparison with predicate:

Item	New Device Biolis 24i	Predicate SYNCHRON CX-7 (k904219)
Intended use	Discrete photometric clinical chemistry analyzer. The device is intended to duplicate manual analytical procedures by automating various steps such as pipetting, heating,	Same

	measuring color intensity, and reporting results.	
System Principle	Discrete, single line random access, multi-test analysis	Same
Throughput	240 tests	225 tests/hr (photometric only)
Configuration	Analytical unit, Control unit	Same
Measurement modes	Absorbance	Same
Detector	Photo-diode	Diffraction grating, photodiode array
Optical system	Wavelength range of 340 to 800nm	340, 380, 410, 470, 520, 560, 600, 650, 670, 700 nm
Light source	Tungsten halogen lamp	xenon
Reaction cuvettes	Plastics, semi disposal	quartz
Path length	8 mm	5 mm
Reaction time	Maximum 10 min.	Maximum 12 min.
Incubation temperature	37°C +/- 0.1°C	same
Glucose	New Device Biolis 24i	Predicate device k802810
Intended use	Quantitative determination of glucose in serum	Same
Specimen types	serum	Serum, plasma, urine, CSF
Method	Photometric endpoint using glucose hexokinase.	Same
Sample Volume	3 uL	same
Reaction Time	5 min Analysis time Read period: 52 - 54 points (15 seconds per point)	5 min

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

- CLSI - Evaluation of Precision Performance of Clinical Chemistry Devices - EP05-A2
- CLSI - Evaluation of the Linearity of Quantitative Analytical Methods - EP06-A
- CLSI - Interference Testing in Clinical Chemistry - EP07-A2
- CLSI - Method Comparison and Bias Estimation Using Patient Samples - EP09-A2
- CLSI - Protocols for Determination of Limits of Detection and Limits of Quantitation - EP17-A

L. Test Principle:

The assay utilizes the enzymatic procedure using the hexokinase and glucose-6-phosphate dehydrogenase for the determination of glucose. The BioLis 24i Clinical System monitors this reaction bichromatically at 340 nm/405 nm. The increase in absorbance is directly proportional to the concentration of glucose in the specimen.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Precision/Reproducibility:

Five individual serum specimens, two spiked with glucose, were assayed 15 times each on two BioLis 24i Clinical Systems with two different lots of Carolina Liquid Chemistries Glucose Reagent. Estimates of repeatability are calculated for each sample as the pooled standard deviation.

Repeatability of Glucose Measurements in mg/dL

Sample	n	mean	SD	%CV
Serum 1	59	60.3	0.8	1.3%
Serum 2	60	106.4	1.4	1.3%
Serum 3	60	116.8	1.4	1.2%
Serum 4	60	192.1	2.2	1.1%
Serum 5	60	446.2	6.8	1.5%

Two serum pools and two control sera were assayed in duplicate over twenty days in two analytical runs per day. Assays were performed on two separate analyzers using two lots of Carolina Liquid Chemistries Glucose Reagent. Estimates of within run and total imprecision are calculated for each analyzer as described in CLSI protocol EP5.

Precision of Glucose Measurement in mg/dL

Analyzer			Within Run Imprecision		Total Imprecision	
Sample	n	mean	SD	%CV	SD	%CV
Analyzer 1						
Control 1	80	63.2	1.0	1.6%	1.5	2.4%
Serum Pool 1	80	118.1	2.2	1.9%	2.9	2.5%
Serum Pool 2	80	188.8	2.0	1.0%	4.1	2.1%
Control 2	80	447.0	6.2	1.4%	10.5	2.3%
Analyzer 2						
Control 1	80	63.2	1.0	1.6%	1.2	1.9%
Serum Pool 1	80	117.6	1.7	1.5%	2.7	2.3%
Serum Pool 2	80	186.9	2.3	1.2%	3.6	1.9%
Control 2	80	445.9	4.8	1.1%	9.8	2.2%

b. Linearity/assay reportable range:

The claimed reportable range is 25 to 500 mg/dL supported by linearity, limit of quantitation and method comparison below.

Linearity

Standards ranging from 0 to 500 mg/dL were assayed in duplicate in

ascending order over 6 individually calibrated runs. The below % difference from the expected values show acceptable linearity with no greater than 5.80 % difference in the claimed measuring range of 25 to 500 mg/dL

Std mg/dL	Run 1	Run 2	Run 3	Run 4	Run 5	Run 6	Mean	Diff	% Diff
0	1.0	0.0	1.0	0.0	1.5	0.0	0.6	0.6	
5	4.0	1.0	2.4	5.0	6.0	7.0	4.2	-0.8	-15.33
25	26.0	25.5	25.0	21.5	25.0	26.0	24.8	-0.2	-0.67
50	52.0	49.5	50.0	46.5	49.5	48.0	49.3	-0.8	-1.50
100	99.5	98.0	100.0	97.0	97.0	96.5	98.0	-2.0	-2.00
150	147.0	148.5	148.0	146.5	144.0	145.0	146.5	-3.5	-2.33
200	196.0	196.5	200.0	197.0	193.5	196.0	196.5	-3.5	-1.75
300	286.0	292.5	297.5	294.0	277.5	284.0	288.6	-11.4	-3.81
400	385.5	387.0	394.5	388.0	365.5	386.0	384.4	-15.6	-3.90
500	464.5	440.5	478.0	485.5	477.0	480.5	471.0	-29.0	-5.80

c. *Traceability, Stability, Expected values (controls, calibrators, or methods):*
Established in k070207 for the Calibrators

d. *Detection limit:*
The limit of detection (LoD) for glucose is 5.64 mg/dL, determined consistent with the guidelines in CLSI protocol EP-17-A4 and with a proportions of false positives less than 5% and false negatives less than 5%, based on 144 determinations, with 80 blank and 64 low level samples; LoB = 3.64 mg/dL. The LoQ is 10 mg/dL glucose, which was determined by assaying a stripped serum pool spiked with 10 mg/dL glucose 64 times.

e. *Analytical specificity:*

Several interfering substances have been identified by assaying spiked serum pools. Significant interference is defined by the sponsor as a shift in results by more than both 4 mg/dL and 4%.and the below data meets levels of acceptable interference as defined.

Interferent	Glucose Concentration	Interferent Concentration	Observed Interference
Ascorbic acid	75 mg/dL	30 mg/L	none
	140 mg/dL		
Bilirubin	90 mg/dL	4.8 mg/dL	-3.3 mg/dL
	146 mg/dL	6.4 mg/dL	-3.6%
Hemoglobin	76 mg/dL	240 mg/dL	-3.6 mg/dL
	139 mg/dL	160 mg/dL	-3.8%

Lipemia	72 mg/dL	600 mg/dL	+ 4 mg/dL
(from Intralipid)	142 mg/dL	80 mg/dL	+ 3.9%
Metronidazole	76 mg/dL	24 mg/L	+ 2.4 mg/dL
	139 mg/dL	48 mg/L	+ 3.1%
Tetracycline	76 mg/dL	15 mg/L	none
	141 mg/dL		

Bilirubin, hemoglobin, lipemia and metronidazole interfere with this test. This information has been included in the labeling..

f. Assay cut-off:
Not Applicable

2. Comparison studies:
   a. Method comparison with predicate device:
   173 Serum specimens ranging in glucose concentration from 26 to 496 mg/dL glucose were collected from individual patients and were assayed for glucose using the Carolina Liquid Chemistries Glucose Reagents with the BioLis 24i Analyzer and the predicate device.
   $y = 0.974x + 2.22$, $r = 0.999$

   b. Matrix comparison:
   Not Applicable – serum is the only sample type indicated

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 range for glucose in serum is 74 to 106 mg/dL*
   * *Burtis CA, Ashwood ER, Bruns DE, editors, Tietz Textbook of Clinical Chemistry and Molecular Diagnostics. Elsevier Inc., St. Louis, MO, 2006.*

N. Instrument Name:
Biolis 24i Clinical 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 read option

4. Specimen Sampling and Handling:

   Direct sample collection tube sampling, routine and stat sampling

5. Calibration:

   Various calibration types such as one point, multiple point, rate

6. Quality Control:

   Contains built in QC program

P. Other Supportive Instrument Performance Characteristics Data Not Covered In The "Performance Characteristics" Section above:
None

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.