510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY

I Background Information:

A 510(k) Number

k200898

B Applicant

Medicon Hellas, S.A

C Proprietary and Established Names

Medicon Hellas Albumin, Medicon Hellas Calcium, Medicon Hellas Creatinine, Medicon Hellas Urea, Medicon Hellas Glucose, Medicon Hellas Total Bilirubin, Medicon Hellas Direct Bilirubin

D Regulatory Information

Product Code(s)	Classification	Regulation Section	Panel
CIX	Class II	21 CFR 862.1035 - Albumin Test System	CH - Clinical Chemistry
CDQ	Class II	21 CFR 862.1770 - Urea nitrogen test system	CH - Clinical Chemistry
CJY	Class II	21 CFR 862.1145 - Calcium test system	CH - Clinical Chemistry
CGX	Class II	21 CFR 862.1225 - Creatinine test system	CH - Clinical Chemistry
CIG	Class II	21 CFR 862.1110 - Bilirubin (total or direct) test system	CH - Clinical Chemistry
CFR	Class II	21 CFR 862.1345 - Glucose test system	CH - Clinical Chemistry
CIG	Class II	21 CFR 862.1110 - Bilirubin (total or direct) test system	CH - Clinical Chemistry

II Submission/Device Overview:

A Purpose for Submission:

New device.

B Measurand:

Albumin, calcium, creatinine, glucose, direct and total bilirubin, and urea nitrogen.

C Type of Test:

Quantitative, colorimetric methods

III Intended Use/Indications for Use:

A Intended Use(s):

See Indications for Use below.

B Indication(s) for Use:

Medicon Hellas Albumin: Reagent for the quantitative measurement of albumin in serum. Albumin measurements are used in the diagnosis and treatments of numerous diseases involving primarily the liver or kidneys.

Medicon Hellas Calcium: Reagent for the quantitative measurement of calcium in serum or urine. Calcium measurements are used in the diagnosis and treatment of parathyroid disease, a variety of bone diseases, chronic renal disease and tetany (intermittent muscular contractions or spasms).

Medicon Hellas Creatinine: Reagent for the quantitative measurement of creatinine in serum and urine. Creatinine measurements are used in the diagnosis and treatment of renal diseases and in monitoring renal dialysis.

Medicon Hellas Glucose: Reagent for the quantitative measurement of glucose in serum and urine. Glucose measurements are used in the diagnosis and treatment of carbohydrate metabolism disorders including diabetes mellitus, neonatal hypoglycemia, and idiopathic hypoglycemia, and of pancreatic islet cell carcinoma.

Medicon Hellas Direct Bilirubin: Reagent for the quantitative measurement of direct bilirubin (conjugated) in serum. Measurements of the level of direct bilirubin is used in the diagnosis and treatment of liver, hemolytic, hematological, and metabolic disorders, including hepatitis and gall blader block.

Medicon Hellas Total Bilirubin: Reagent for the quantitative measurements of total bilirubin in serum. Measurements of the levels of total bilirubin is used in the diagnosis and treatment of liver, hemolytic hematological, and metabolic disorders, including hepatitis and gall bladder block.

Medicon Hellas Urea Nitrogen: Reagent for the quantitative measurement of urea nitrogen in serum and urine. Measurements are used in the diagnosis and treatment of certain renal and metabolic diseases.

C Special Conditions for Use Statement(s):
Rx - For Prescription Use Only

D Special Instrument Requirements:

Diatron Pictus 500 clinical chemistry analyzer

IV Device/System Characteristics:

Device Description:

Medicon Hellas Albumin - Reagent Composition:
Succinic acid buffer (pH 4.2±0.1): 500 mM
Bromocresol green: 0.75 mM
Brij 35: 0.9%
Non reactive ingredients, preservative

Medicon Hellas Calcium - Reagent Composition:
MES buffer (pH 6.5): 100 mmol/L
Arsenazo III: 1.5 mmol/L
Non reactive ingredients, preservative

Medicon Hellas Creatinine - Reagent Composition:
Reagent 1:
NaOH: 1.0 M
Detergent: 0.4 %
Non-reactive components and preservatives
Reagent 2:
Picric acid: 22 mM
Non- reactive components and preservatives

Medicon Hellas Glucose - Reagent Composition:
Reagent 1:
Tris Buffer (pH 7.8): 150 mM
NAD+: 3 mM
ATP: 3 mM
Non reactive components and preservatives
Reagent 2:
Tris Buffer (pH 7.8): 0.5 M
Hexokinase: < 22 kU/L
G-6-PDH: < 26 kU/L
Non reactive components and preservatives

Medicon Hellas Direct Bilirubin - Reagent Composition:
Reagent 1:
Sulfanilic acid: 32 mM
Hydrochloric acid: 165 mM
Reagent 2 (R2):
Sodium nitrite: 60 mM

Medicon Hellas Total Bilirubin - Reagent Composition:
Reagent 1:
DPD: 2.2 mM
HCl: 120 mM
Surfactants
Reagent 2:
HCl: 120 mM

Medicon Hellas Urea Nitrogen - Reagent Composition:
Reagent 1:
Tris buffer (pH 7.4): 150 mM
Urease: ≤ 30 kU/L
GLDH: ≤ 1 kU/L
ADP: 10 mM
α-Ketoglutarate: 10 mM
Non-reactive ingredients and preservatives.
Reagent 2:
Tris buffer (pH 7.7): 20 mM
NADH: 0.32 mM
Non-reactive ingredients and preservatives.

A Principle of Operation:

Medicon Hellas Albumin:
The bromocresol green (BCG) method is applied, without serum blank. The bi-chromatic photometric determination of albumin is based on albumin binding the anionic dye bromocresol green in mildly acidic pH. The increase ~~raise~~ in absorbance at 620/750 nm is proportional to the concentration of albumin in the sample. The sample volume used for the assay is 2 µL.

Medicon Hellas Calcium:
Calcium ions react with Arsenazo III dye in acidic pH, to form a violet complex. The absorbance at 650/750 nm is proportional to the concentration of calcium in serum or urine samples. The analyzer photometer reads the absorbance at time intervals dictated by the method application stored in the analyzer memory, and the change in absorbance is calculated automatically. The sample volume used for the assay is 2 µL for serum or urine samples.

Medicon Hellas Creatinine:
Creatinine forms a yellow-orange complex with picrate anions in alkaline medium. The rate of change of absorbance of the complex at 505/700 nm is proportional to creatinine concentration in

serum or urine samples. The sample volume used for the assay is 22 µL for serum or urine samples.

Medicon Hellas Glucose (Hexokinase):
The determination of glucose, according to the hexokinase method, is based on the following reactions, using 2 µL of sample for serum or urine samples.

$$\text{Glucose + ATP} \xrightarrow{\text{Hexokinase}} \text{6-phosphate glucose + ADP}$$

$$\text{6-phosphate glucose + NAD} \xrightarrow{\text{G-6PDH}} \text{6-phosphate gluconic acid + NADH}$$

The concentration of glucose is determined bi-chromatically by the absorbance change at 340/380 nm.

Medicon Hellas Direct Bilirubin:
The modified Malloy-Evelyn method is applied on serum samples. Direct (conjugated) bilirubin reacts with diazotised sulfanilic acid in acidic pH to form azobilirubin, a colored chromophore. The absorbance of chromophore at 550/650 nm is proportional to the concentration of direct bilirubin in the sample. The free (unbound) bilirubin fraction does not react. The reaction is an end-point type. The sample volume used for the assay is 8 µL

Medicon Hellas Total Bilirubin:
The DPD method is applied, whereby 3,5-dichlorophenyldiazonium tetrafluoroborate (DPD) binds directly to total bilirubin in acidic medium, forming azobilirubin, whose rate of absorbance at 550/700 nm is proportional to the concentration of total bilirubin in the sample. The analyzer photometer reads the absorbance at time intervals dictated by the method application stored in the analyzer memory, and the change in absorbance is calculated automatically. The sample volume used by the assay is 20 µL.

Medicon Hellas Urea Nitrogen:
Urea Nitrogen is determined according to the following reactions, using 7 µL of sample for serum and urine samples:

$$\text{Urea + } H_2O \xrightarrow{\text{Urease}} 2\ NH_3 + CO_2$$

$$2\ NH_4^+ + \text{2-α-Ketoglutarate + 2 NADH} \xrightarrow{\text{GLDH}} \text{2-L-Glutamate + 2 } NAD^+ + 2\ H_2O$$

The rate of absorbance change at 340/380 nm is proportional to the urea nitrogen concentration in the sample.

For all assays the analyzer photometer reads the absorbances at time intervals dictated by the method application stored in the analyzer memory, and the change in absorbance is calculated automatically.

V Substantial Equivalence Information:

A Predicate Device Name(s):
Beckman Coulter (BC) AU Albumin, Calcium, Creatinine, Direct Bilirubin, Glucose, Total Bilirubin and Urea Nitrogen Reagents
Abbott Diagnostics (AD) Direct Bilirubin Reagent

B Predicate 510(k) Number(s):

k924368, k061575, k934361, k022180, k944406, k924964 and k944250

C Comparison with Predicate(s):

Device Comparison Table: Albumin

Device & Predicate Device(s):	k200898	k924368
Device Trade Name	Medicon Hellas Albumin	BC AU Albumin Reagent
General Device Characteristic Similarities		
Intended Use/Indications For Use	Quantitative determinations of albumin in serum samples	Same
Mode of Detection	Photometric	Same
Analytical Measure	Endpoint and kinetic with sample blanking	Same
General Device Characteristic Differences		
Instrument Platform	Diatron Pictus 500	Beckman Coulter AU2700 Analyzer (k002982)
Wavelengths	12 (340-750 nm)	13 (340-800 nm)
Measuring Range	1.5-6.0 g/dL	1.5-6.0 mg/dL

Device Comparison Table: Calcium

Device & Predicate Device(s):	k200898	k061575
Device Trade Name	Medicon Hellas Calcium	BC AU Calcium Reagent
General Device Characteristic Similarities		
Intended Use/Indications For Use	Quantitative determinations of calcium in serum or urine samples	Same
Mode of Detection	Photometric	Same
Analytical Measure	Endpoint and kinetic with sample blanking	Same

General Device Characteristic Differences		
Instrument Platform	Diatron Pictus 500	Beckman Coulter AU2700 Analyzer (k002982)
Wavelengths	12 (340-750 nm)	13 (340-800 nm)
Measuring Range	4.0-18.0 mg/dL (serum) 1.5-40.0 mg/dL (urine)	4.0-18.0 mg/dL 0.1-40.0 mg/dL

Device Comparison Table: Creatinine

Device & Predicate Device(s):	k200898	k934361
Device Trade Name	Medicon Hellas Creatinine	BC AU Creatinine Reagent
General Device Characteristic Similarities		
Intended Use/Indications For Use	Quantitative determinations of creatinine in serum or urine samples	Same
Mode of Detection	Photometric	Same
Analytical Measure	Endpoint and kinetic with sample blanking	Same
General Device Characteristic Differences		
Instrument Platform	Diatron Pictus 500	Beckman Coulter AU2700 Analyzer (k002982)
Wavelengths	12 (340-750 nm)	13 (340-800 nm)
Measuring Range	0.2-25.0 mg/dL (serum) 1.1-300.0 mg/dL (urine)	0.2-25.0 mg/dL (serum) 1.0-300.0 mg/dL (urine)

Device Comparison Table: Direct Bilirubin

Device & Predicate Device(s):	k200898	k022180
Device Trade Name	Medicon Hellas Direct Bilirubin	AD Direct Bilirubin Assay
General Device Characteristic Similarities		
Intended Use/Indications For Use	Quantitative determination of direct	Same

Device & Predicate Device(s):	k200898	k022180
	bilirubin in human serum samples.	
Mode of Detection	Photometric	Same
Analytical Measure	Endpoint and kinetic with sample blanking	Same
General Device Characteristic Differences		
Instrument Platform	Diatron Pictus 500	Architect c8000 System
Wavelengths	12 (340-750 nm)	16 (340-804 nm)
Measuring Range	0.2-15.0 mg/dL	0.05-16.9 mg/dL

Device Comparison Table: Glucose

Device & Predicate Device(s):	k200898	k944406
Device Trade Name	Medicon Hellas Glucose	BC AU Glucose Reagent
General Device Characteristic Similarities		
Intended Use/Indications For Use	Quantitative determinations of glucose in serum or urine samples	Same
Mode of Detection	Photometric	Same
Analytical Measure	Endpoint and kinetic with sample blanking	Same
General Device Characteristic Differences		
Instrument Platform	Diatron Pictus 500	Beckman Coulter AU2700 Analyzer (k002982)
Wavelengths	12 (340-750 nm)	13 (340-800 nm)
Measuring Range	10-700 mg/dL (serum) 10-700 mg/dL (urine)	10-800 mg/dL (serum) 10-700 mg/dL (urine)

Device Comparison Table: Total Bilirubin

Device & Predicate Device(s):	k200898	k924964
Device Trade Name	Medicon Hellas Total Bilirubin	BC AU Total Bilirubin Reagent
General Device Characteristic Similarities		
Intended Use/Indications For Use	Quantitative determinations of total bilirubin in serum	Same
Mode of Detection	Photometric	Same
Analytical Measure	Endpoint and kinetic with sample blanking	Same
General Device Characteristic Differences		
Instrument Platform	Diatron Pictus 500	Beckman Coulter AU2700 Analyzer (k002982)
Wavelengths	12 (340-750 nm)	13 (340-800 nm)
Measuring Range	0.1-30.0 mg/dL	0.0-30.0 mg/dL

Device Comparison Table: Urea Nitrogen

Device & Predicate Device(s):	k200898	k944250
Device Trade Name	Medicon Hellas Urea Nitrogen	BC AU Urea Nitrogen Reagent
General Device Characteristic Similarities		
Intended Use/Indications For Use	Quantitative determinations of urea nitrogen in serum or urine samples	Same
Mode of Detection	Photometric	Same
Analytical Measure	Endpoint and kinetic with sample blanking	Same
General Device Characteristic Differences		
Instrument Platform	Diatron Pictus 500	Beckman Coulter AU2700 Analyzer (k002982)
Wavelengths	12 (340-750 nm)	13 (340-800 nm)
Measuring Range	3-100 mg/dL (serum)	2-130 mg/dL (serum)

	24-1300 mg/dL (urine)	20-1300 mg/dL (urine)

VI Standards/Guidance Documents Referenced:

CLSI EP05-A3 - Evaluation of Precision of Quantitative Measurement Procedures; Approved Guideline - Third Edition.

CLSI EP06-A – Evaluation of Linearity of Quantitative Measurement Procedures: A Statistical Approach; Approved Guideline

CLSI EP07-A3 – Interference Testing in Clinical Chemistry; Approved Guideline – Third Edition

CLSI EP09c – Measurement Procedure Comparison and Bias Estimation Using Patient Samples; Approved Guideline - Third Edition.

CLSI EP17-A2 – Evaluation of Detection Capability for Clinical Laboratory Measurement Procedures; Approved Guideline – Second Edition

CLSI EP37 - Supplemental Tables for Interference Testing in Clinical Chemistry - First Edition.

VII Performance Characteristics (if/when applicable):

1. Analytical Performance:

a) Precision/Reproducibility:

Precision studies were conducted according to the CLSI EP05-A3 guideline.

Within-run precision:
Control samples (low, medium and high levels) were tested using 20 replicates per level. Testing was performed on one Pictus 500 analyzer using three lots of reagents except for Calcium and Urea Nitrogen, for which two lots of reagents were used.

Total precision:
Control samples (low, medium and high levels) were tested in duplicate, twice a day, for 20 days, for a total of 80 results per level. Testing was performed on one Pictus 500 analyzer using three lots of reagents except for Calcium and Urea Nitrogen, for which two lots of reagents were used.

The within-run and total precision results for a representative reagent lot for each analyte are presented in the tables below.

Albumin			Repeatability (N=20)			Between Run (N=2x2, 20 days)			Within Lab/Total (N=2x2, 20 days)		
Sample	**Level**	**U/M**	**Mean**	**SD**	**%CV**	**Mean**	**SD**	**%CV**	**Mean**	**SD**	**%CV**
Serum control	1	g/dL	3.1	0.07	2.21	3.1	0.16	5.25	3.1	0.18	5.70
	2	g/dL	4.0	0.06	1.45	4.0	0.15	3.80	4.0	0.19	4.80
	3	g/dL	5.2	0.07	1.37	5.2	0.12	2.36	5.3	0.24	4.61

Calcium			Repeatability (N=20)			Between Run (N=2x2, 20 days)			Within Lab/Total (N=2x2, 20 days)		
Sample	**Level**	**U/M**	**Mean**	**SD**	**%CV**	**Mean**	**SD**	**%CV**	**Mean**	**SD**	**%CV**
Serum control	1	mg/dL	5.9	0.07	1.16	5.9	0.20	3.37	5.9	0.32	5.44
	2	mg/dL	8.6	0.09	1.06	8.6	0.13	1.51	8.6	0.35	4.07
	3	mg/dL	12.7	0.10	0.82	12.7	0.25	1.95	12.7	0.44	3.49
Urine control	1	mg/dL	6.2	0.16	2.59	6.2	0.09	1.48	6.2	0.23	3.73
	2	mg/dL	12.9	0.25	1.90	12.9	0.49	3.82	12.9	0.67	5.21
	3	mg/dL	30.6	0.40	1.31	30.6	0.90	2.95	30.6	1.07	3.51

Creatinine			Repeatability (N=20)			Between Run (N=2x2, 20 days)			Within Lab/Total (N=2x2, 20 days)		
Sample	Level	U/M	Mean	SD	%CV	Mean	SD	%CV	Mean	SD	%CV
Serum control	1	mg/dL	1.3	0.03	2.41	1.3	0.05	3.63	1.3	0.08	6.40
	2	mg/dL	4.9	0.05	1.08	4.9	0.22	4.58	4.9	0.23	4.71
	3	mg/dL	9.6	0.10	1.04	9.6	0.22	2.30	9.6	0.28	2.92
Urine control	1	mg/dL	63.4	1.31	2.07	63.4	1.68	2.66	63.4	2.15	3.39
	2	Mg/dL	100.6	1.39	1.38	100.6	1.84	1.83	100.6	2.31	2.29
	3	mg/dL	308.6	3.81	1.23	308.6	6.16	2.00	308.6	7.25	2.35

Direct Bilirubin			Repeatability (N=20)			Between Run (N=2x2, 20 days)			Within Lab/Total (N=2x2, 20 days)		
Sample	Level	U/M	Mean	SD	%CV	Mean	SD	%CV	Mean	SD	%CV
Serum control	1	mg/dL	0.7	0.02	3.11	0.7	0.02	2.31	0.7	0.03	4.98
	2	mg/dL	1.8	0.04	2.46	1.8	0.06	3.14	1.8	0.08	4.70
	3	mg/dL	7.5	0.19	2.48	7.5	0.17	2.29	7.5	0.34	4.52

Glucose			Repeatability (N=20)			Between Run (N=2x2, 20 days)			Within Lab/Total (N=2x2, 20 days)		
Sample	Level	U/M	Mean	SD	%CV	Mean	SD	%CV	Mean	SD	%CV
Serum control	1	mg/dL	66	1.1	1.72	66	0.9	1.35	66	1.9	2.88
	2	mg/dL	101	1.0	0.99	101	1.5	1.48	101	1.8	1.78
	3	mg/dL	303	2.9	0.96	303	6.3	2.08	303	9.5	3.13
Urine control	1	mg/dL	14	0.5	3.63	14	0.2	1.12	14	1.0	6.86
	2	mg/dL	134	2.2	1.67	134	1.2	0.93	134	3.2	2.43
	3	mg/dL	532	7.9	1.49	532	7.6	1.43	532	17.9	3.36

Total Bilirubin			Repeatability (N=20)			Between Run (N=2x2, 20 days)			Within Lab/Total (N=2x2, 20 days)		
Sample	Level	U/M	Mean	SD	%CV	Mean	SD	%CV	Mean	SD	%CV
Serum control	1	mg/dL	1.4	0.01	0.92	1.4	0.02	1.69	1.4	0.04	2.97
	2	mg/dL	5.5	0.02	0.38	5.5	0.08	1.38	5.5	0.20	3.56
	3	mg/dL	9.6	0.05	0.57	9.6	0.17	1.79	9.6	0.27	2.86

Urea Nitrogen			Repeatability (N=20)			Between Run (N=2x2, 20 days)			Within Lab/Total (N=2x2, 20 days)		
Sample	Level	U/M	Mean	SD	%CV	Mean	SD	%CV	Mean	SD	%CV
Serum control	1	mg/dL	10	0.2	1.94	10	0.2	2.24	10	0.3	2.97
	2	mg/dL	19	0.4	2.14	19	0.5	2.56	19	0.6	3.34
	3	mg/dL	51	0.5	1.07	51	1.6	3.16	51	1.7	3.34
Urine control	1	mg/dL	371	6.7	1.81	371	8.7	2.35	371	11.5	3.10
	2	mg/dL	700	11.8	1.69	700	20.4	2.92	700	23.6	3.37

b) Linearity:

Linearity studies were conducted according to the CLSI EP06-A guideline.

For each analyte and sample type series of nine levels were prepared by serial dilution of a known high level sample to produce samples with concentrations spanning the corresponding claimed measuring intervals. Three reagent lots were evaluated. For each reagent lot, each level was tested in quadruplicate on the Pictus P500 Analyzer. Results from each level were averaged and compared against the expected values using linear regression analysis. The results of the linearity studies support the claimed measuring ranges. The regression analysis results for a representative reagent lot for each analyte are summarized below.

Analyte	Sample Matrix	Claimed Measurement Range	Slope	Intercept	r
Albumin	Serum	1.5 – 6.0 g/dL	0.9641	0.16	0.9992
Calcium	Serum	4.0 – 18.0 mg/dL	0.9903	0.14	0.9999
	Urine	2.0 – 40.0 mg/dL	1.0232	-0.42	0.9993
Creatinine	Serum	0.3 – 25.0 mg/dL	0.9856	0.09	0.9997
	Urine	1.2 – 300.0 mg/dL	0.9822	2.97	0.9996
Direct Bilirubin	Serum	0.2 - 15.0 mg/dL	1.0048	0.07	0.9992
Glucose Hexokinase	Serum	10 - 700 mg/dL	1.0039	3.3	0.9999
	Urine	10 - 660 mg/dL	0.9808	4.3	0.9996
Total Bilirubin	Serum	0.1 – 30.0 mg/dL	0.9867	0.20	0.9999
Urea Nitrogen	Serum	3 - 100 mg/dL	0.9942	1.27	0.9996
	Urine	24 - 1300 mg/dL	0.9970	6.55	0.9992

c) Analytical Specificity/Interference:

Interference studies were conducted according to the CLSI EP07-A guideline and measured the effect of endogenous and exogenous substances on neat samples assayed using each of the Medicon reagents on the Pictus 500 Clinical Analyzer.

Serum and urine sample pools at low and high levels of each analyte were prepared, then spiked with increasing concentrations of the interference compounds. The spiked and control samples were tested in duplicate, and the results were averaged. In each case, the spiked sample result mean was compared to the control (zero interferent) mean result, and bias values were calculated. Non-interference levels were defined as the concentration at which the spiked sample value was ≤ ±10% of the control sample value for both serum and urine samples. The results of the interference studies for each candidate reagent are summarized below:

Albumin:

Sample Matrix	Interferent	Highest concentration tested that did not cause significant interference
Serum	Unconjugated Bilirubin	20 mg/dL
	Conjugated Bilirubin	20 mg/dL
	Hemoglobin	500 mg/dL
	Triglycerides	3000 mg/dL
	L-ascorbic acid	3.0 mg/dL
	Acetaminophen	15.6 mg/dL
	Acetylsalicylic Acid	3.0 mg/dL
	Aminosalicylic Acid	45.5 mg/dL
	Ibuprofen	21.9 mg/dL

Calcium:

Sample Matrix	Interferent	Highest concentration tested that did not cause significant interference
Serum	Unconjugated Bilirubin	20 mg/dL
	Conjugated Bilirubin	20 mg/dL
	Hemoglobin	500 mg/dL
	Triglycerides	3000 mg/dL
	L-ascorbic acid	3.0 mg/dL
	Acetaminophen	15.6 mg/dL
	Acetylsalicylic Acid	3.0 mg/dL
	Ibuprofen	21.9 mg/dL
Urine	Conjugated Bilirubin	50 mg/dL
	Hemoglobin	500 mg/dL
	L-ascorbic acid	500 mg/dL
	Glucose	10 g/dL
	Magnesium	4 mmol/L
	Albumin	500 mg/dL

Sample Matrix	Interferent	Highest concentration tested that did not cause significant interference
	Boric Acid	500 mg/dL
	Ibuprofen	21.9 mg/dL
	IgG	500 mg/dL
	pH	6.0
	Specific Gravity	1.01-1.03

Creatinine:

Sample Matrix	Interferent	Highest concentration tested that did not cause significant interference
Serum	Bilirubin	10 mg/dL
	Hemoglobin	220 mg/dL
	Triglycerides	1200 mg/dL
	L-ascorbic acid	3.0 mg/dL
	Acetaminophen	15.6 mg/dL
	Acetylsalicylic Acid	3.0 mg/dL
	Cefazolin	40 mg/dL
	Cefoxitin	6.0 mg/dL
	Cephalothin	12 mg/dL
	Chloramphenicol	7.8 mg/dL
	Dopamine	0.062 mg/dL
	Etamsylate	6.0 mg/dL
	Flucytosine	20.4 mg/dL
	Furosemide	1.59 mg/dL
	Ibuprofen	23.9 mg/dL
	Streptomycin	25.8 mg/dL
Urine	Bilirubin	40 mg/dL
	Hemoglobin	5.0 g/L
	Glucose	3000 mg/dL
	L-ascorbic acid	50 mg/dL
	Boric Acid	500 mg/dL
	pH	2-12
	Specific Gravity	1.01-1.03

Direct Bilirubin:

Sample Matrix	Interferent	Highest concentration tested that did not cause significant interference
Serum	Hemoglobin	40 mg/dL
	Triglycerides	3000 mg/dL
	L-ascorbic acid	2.7 mg/dL
	Acetaminophen	15.6 mg/dL
	Acetylsalicylic	3.0 mg/dL

Sample Matrix	Interferent	Highest concentration tested that did not cause significant interference
	Ibuprofen	21.9 mg/dL

Glucose:

Sample Matrix	Interferent	Highest concentration tested that did not cause significant interference
Serum	Acetaminophen	15.6 mg/L
	Acetylsalicylic Acid	3.0 mg/dL
	Albumin	7.5 g/L
	Bilirubin	20 mg/dL
	Conjugated Bilirubin	20 mg/dL
	Hemoglobin	500 mg/dL
	Ibuprofen	21.9 mg/dL
	IgG	7500 mg/dL
	L-ascorbic acid	3.0 mg/dL
	Triglycerides	3000 mg/dL
	Uric Acid	20 mg/dL
Urine	Albumin	500 mg/dL
	Calcium	50 mg/dL
	Conjugated Bilirubin	50 mg/dL
	Creatinine	300 mg/dL
	Hemoglobin	500 mg/dL
	IgG	500 mg/dL
	L-ascorbic acid	500 mg/dL
	Urea	6000 mg/dL
	Uric Acid	250 mg/dL
	pH	2-12
	Specific Gravity	1.01-1.03

Total Bilirubin:

Sample Matrix	Interferent	Highest concentration tested that did not cause significant interference
Serum	Bilirubin	N/A
	Hemoglobin	75 mg/dL
	Triglycerides	1800 mg/dL
	L-ascorbic acid	3.0 mg/dL
	Acetaminophen	15.6 mg/dL
	Acetylsalicylic Acid	3.0 mg/dL
	Ibuprofen	21.9 mg/dL

Urea Nitrogen:

Sample Matrix	Interferent	Highest concentration tested that did not cause significant interference
Serum	Bilirubin	20 mg/dL
	Conjugated Bilirubin	20 mg/dL
	Hemoglobin	250 mg/dL
	Triglycerides	3000 mg/dL
	L-ascorbic acid	3.0 mg/dL
	Acetaminophen	15.6 mg/dL
	Acetylsalicylic Acid	3.0 mg/dL
	Aminosalicylic Acid	45.5 mg/dL
	Cefoxitin	220 mg/dL
	Chloramphenicol	7.8 mg/dL
	Ibuprofen	23.9 mg/dL
	Methyldopa	2.25 mg/dL
	Streptomycin	25.8 mg/dL
Urine	Conjugated Bilirubin	40 mg/dL
	Hemoglobin	500 mg/dL
	L-Ascorbic Acid	50 mg/dL
	Albumin	500 mg/dL
	Furosemide	1.59 mg/dL
	Glucose	5000 mg/dL
	pH	2-12
	Specific Gravity	1.01-1.03

For creatinine, glucose, direct bilirubin, total bilirubin and urea nitrogen, the sponsor included the following limitations in their labeling:
"Do not use hemolyzed, contaminated or turbid sample specimens."

d) Assay Reportable Range:

See Section VII.1.b – Linearity above.

e) Traceability, Stability, Expected Values (Controls, Calibrators, or Methods):

The Medicon reagents are traceable to the following reference materials:

Parameter	Reference Material
Albumin	IRMM reference material ERM-DA470
Calcium	NIST reference material SRM 956b and SRM909b and by the Atomic Absorption Reference Method
Creatinine	NIST reference material 909b level 2/SRM967 level 2 and by the reference method ID-GC/MS
Direct Bilirubin	NIST reference material SRM 916a
Glucose (Hexokinase)	NIST reference material SRM917b and SRM965a
Total Bilirubin	NIST reference material SRM 916a

Parameter	Reference Material
Urea	NIST reference material SRM 909b

f) Detection Limit:

The limit of blank (LoB), limit of detection (LoD) and limit of quantitation (LoQ) studies were performed according to the CLSI EP17-A2 guideline.

Limit of blank (LoB) and limit of detection (LoD) studies were performed by testing 5 blank samples and 5 low level samples 4 times a day for a total of 60 measurements in 3 days, using 2 or 3 reagent lots . Data was analyzed using non-parametrical statistical analysis. The LoD was calculated from LoB using the following equation: LoB + 1.654 SD.

To determine limit of quantitation (LoQ), 10 low level samples were measured 5 times each day for a total of 150 measurements in 3 days. LoQ was defined using an imprecision acceptance criterion of ≤ 20% CV.

The results are summarized in the table below:

Analyte	Sample Matrix	LoB	LoD	LoQ
Albumin	Serum	0.3 g/dL	0.4 g/dL	0.5 g/dL
Calcium	Serum	0.2 mg/dL	0.5 mg/dL	0.5 mg/dL
	Urine	0.8 mg/dL	1.3 mg/dL	1.5 mg/dL
Creatinine	Serum	0.10 mg/dL	0.2 mg/dL	0.2 mg/dL
	Urine	0.6 mg/dL	1.0 mg/dL	1.1 mg/dL
Glucose	Serum	1.0 mg/dL	1.7 mg/dL	4.0 mg/dL
	Urine	1.0 mg/dL	2.4 mg/dL	6.0 mg/dL
Direct Bilirubin	Serum	0.07 mg/dL	0.11 mg/dL	0.17 mg/dL
Total Bilirubin	Serum	0.00 mg/dL	0.01 mg/dL	0.09 mg/dL
Urea Nitrogen	Serum	1.0 mg/dL	1.9 mg/dL	3.1 mg/dL
	Urine	16.0 mg/dL	20.9 mg/dL	23.7 mg/dL

g) Assay Cut-Off:

Not applicable.

2. Comparison Studies:

a) Method Comparison with Predicate Device:

Performance of the Medicon Albumin, Calcium, Creatinine, Glucose, Total Bilirubin and Urea Nitrogen reagents for serum and (where applicable) urine assayed on the Pictus 500 analyzer was compared with the predicate devices, Beckman Coulter reagents assayed on the AU2700 analyzer. Performance of the Medicon Direct Bilirubin reagent assayed on the Pictus 500 analyzer was compared to predicate device, Abbott Diagnostics (AD) Direct Bilirubin reagent assayed on the AD Architect c8000 analyzer.

Between 77-126 human serum and urine samples were tested in singlicate on the candidate and predicate systems using at least three lots of Medicon reagents. Less than 10% of samples were spiked or diluted to cover the analytical measurement ranges. Results were analyzed using Deming regression statistics for Albumin, Calcium, Creatinine, Glucose, Total Bilirubin and Urea Nitrogen, and the weighted Deming approach was used for Direct Bilirubin.

The summary of the results for a representative lot are provided in the table below:

Analyte	Sample Matrix	N	Sample concentration range tested	Slope	Intercept	R^2
Albumin	Serum	112	1.6-5.9 g/dL	1.0180	0.05	0.9862
Calcium	Serum	94	4.0-18.0 mg/dL	1.0099	-0.3	0.9949
	Urine	81	2.3-39.9 mg/dL	0.9888	-0.8	0.9965
Creatinine	Serum	126	0.3-25.0 mg/dL	1.0207	-0.10	0.9989
	Urine	98	1.9-286.9 mg/dL	0.9904	-0.81	0.9992
Direct Bilirubin	Serum	77	0.2-14.7 mg/dL	0.9656	-0.01	0.9978
Glucose	Serum	99	13-696 mg/dL	0.9715	2.7	0.9992
	Urine	100	10-656 mg/dL	1.0222	-0.9	0.9989
Total Bilirubin	Serum	95	0.3-29.1 mg/dL	1.0125	-0.06	0.9996
Urea Nitrogen	Serum	116	3-93 mg/dL	1.0001	-0.2	0.9983
	Urine	81	31-1244 mg/dL	0.9844	21.9	0.9972

b) Matrix Comparison:

Not applicable.

3. Clinical Studies:

a) Clinical Sensitivity:

Not applicable.

b) Clinical Specificity:

Not applicable.

c) Other Clinical Supportive Data (When 1. and 2. Are Not Applicable):

Not applicable.

4. Clinical Cut-Off:

Not applicable.

5. Expected Values/Reference Range:

The following reference ranges, cited from the scientific literature, were included in the labeling. The labeling also states "Reference intervals may vary with age, sex, sample type, diet and geographical location. Each laboratory should determine its own reference intervals as dictated by good laboratory practices."

Analyte	Sample Matrix	Reference Range
Albumin[1]	Serum	3.5 – 5.0 g/dL
Calcium[1,2]	Serum	8.4-10.2 mg/dL
	Urine	12.39 ± 8.19 mg/dL
Creatinine[1,3]	Serum	Female: 0.6-1.2 mg/dL Male: 0.7-1.3 mg/dL
	Urine	22.6-300 mg/dL
Glucose[1,4,5]	Serum	70 – 105 mg/dL
	Urine	1 – 15 mg/dL
Direct Bilirubin[6]	Serum	<0.3 mg/dL
Total Bilirubin[1]	Serum	0.2 – 1.0 mg/dL
Urea Nitrogen[1]	Serum	7-21 mg/dL
	Urine	800-1333 mg/dL

1) Tietz, NW, ed. Clinical Guide to Laboratory Tests. 3rd. ed. Philadelphia: W.B. Saunders Company Ltd., 1995.
2) Topal, C., Algun, E, Sayarlioglu, H, Erkoc, R, Soyoral, Y, Dogan, E, Sekeroglu, R and Cekici, S. Diurnal Rhythm of Urinary Calcium Excretion in Adults. Ren. Fail 2008, 30(5): 499-501.
3) Aydogu, M, Oral, S and Akgur, SA.The impact of creatinine reference value. Normalization of urinary drug concentrations. J. Forensic Sci. 2021; 00, 1-7.
4) Thomas L. Blood glucose. In Thomas L, ed. Clinical laboratory diagnostics. Use and assessment of clinical laboratory results. Frankfurt/Main: TH-Books Verlagsgesellschaft 1998:131-137.
5) Sacks DB, Bruns DE, Goldstein DE, MacLaren NK et al. Guidelines and recommendations for laboratory analysis in the diagnosis and management of diabetes mellitus. Clin Chem 2002; 48:436-72.
6) Limbach, HJ, Schmidt-Gayk, H, Watch, S, Kiral, H, Lorenz, S, Fahr, A, Turnwald-Maschler, A, Holfelder, M and Porch, G in Laboratory Test Index, 16th edition 2001.

VIII Proposed Labeling:

The labeling supports the finding of substantial equivalence for this device.

IX Conclusion:

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