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

A. 510(k) Number:

k123018

B. Purpose for Submission:

New instrument (ACE Alera) and addition of lithium heparin plasma sample to already cleared reagents (ISE and glucose assays on the ACE and ACE Axcel instruments)

C. Measurand:

Glucose, Sodium, Potassium, Chloride

D. Type of Test:

Quantitative, photometric and ion selective electrodes

E. Applicant:

Alfa Wassermann Diagnostic Technologies, LLC.

F. Proprietary and Established Names:

ACE Alera Clinical Chemistry System

ACE Glucose Reagent

ACE Ion Selective Electrode (ISE) Module

G. Regulatory Information:

Product Code	Classification	Regulation Section	Panel
JJE	I, exempt	862.2160 Discrete photometric chemistry analyzer for clinical use	75-Chemistry
CFR	II	862.1345, Glucose test system	75-Chemistry
JGS	II	21 CFR 862.1665 Sodium test system	75-Chemistry

CEM	II	21 CFR 862.1600 Potassium test system	75-Chemistry
CGZ	II	21 CFR 862.1170 Chloride test system	75-Chemistry

H. Intended Use:

1. Intended use(s):

   See Indications for use below.

2. Indication(s) for use:

   ACE Alera Clinical Chemistry System

   The ACE Alera Clinical Chemistry System is an automated, discrete, bench-top, random access analyzer that is intended for *in vitro* diagnostic in the quantitative measurement of general chemistry assays, such as glucose, sodium, potassium, and chloride, for clinical use in physician office laboratories or clinical laboratories.

   - 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.
   - Sodium measurements are used in the diagnosis and treatment of diseases involving electrolyte imbalance.
   - Potassium measurements are used to monitor electrolyte balance in the diagnosis and treatment of disease conditions characterized by low or high blood potassium levels.
   - Chloride measurements are used in the diagnosis and treatment of electrolyte and metabolic disorders such as cystic fibrosis and diabetic acidosis.

   ACE Glucose Reagent

   ACE Glucose Reagent is intended for the quantitative determination of glucose in serum or lithium heparin plasma using the ACE, ACE Alera, or ACE Axcel Clinical Chemistry Systems. 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. This test is intended for use in clinical laboratories or physician office laboratories. For in vitro diagnostic use only.

   ACE Ion Selective Electrode (ISE) Module

   The ACE Ion Selective Electrode (ISE) module on the ACE, ACE Alera, and ACE Axcel Clinical Chemistry Systems is used to measure concentrations of sodium, potassium, and chloride in undiluted serum and lithium heparin plasma.

- Sodium measurements are used in the diagnosis and treatment of diseases involving electrolyte imbalance.
- Potassium measurements are used to monitor electrolyte balance in the diagnosis and treatment of disease conditions characterized by low or high blood potassium levels.
- Chloride measurements are used in the diagnosis and treatment of electrolyte and metabolic disorders such as cystic fibrosis and diabetic acidosis.

This test is intended for use in clinical laboratories and physician office laboratories. For *in vitro* diagnostic use only.

3 Special conditions for use statement(s):

For prescription and point-of-care use.

4. Special instrument requirements:

ACE Alera Clinical Chemistry System

I. Device Description:

ACE Alera Clinical Chemistry System

The ACE Alera Clinical Chemistry System is an automated, discrete, random access wet chemistry system, intended for use in clinical laboratories or physician office laboratories. They are intended for in vitro diagnostic use. They consist of a bench-top analyzer and a computer. The bench-top analyzer includes a single pipettor (syringe module/fluid arm/probe), a temperature-controlled reagent compartment, a reaction wheel, and a holographic diffraction grating spectrophotometer. During analysis, samples and reagents are pipetted into disposable cuvettes contained in the reaction wheel. The ACE Alera has an on-board computer, keyboard and monitor, with an ion selective electrode (ISE) module for simultaneous (to the photometer) potentiometric measurements of sodium, potassium and chloride.

The ACE reagent kits used with the ACE Axcel Clinical Chemistry System consist of natural or brown plastic bottles containing liquid-stable reagents. The reagents have a dot code label applied to the bottom of the bottle to identify each bottle to the ACE Axcel system. Reagent kits typically have either one reagent (R1) or sometimes a second reagent (R2) and an Evap-Cap.

ACE Glucose Reagent

Glucose reagent kit contains Nicotinamide adenine dinucleotide (NAD) 2 mmol/L, Adenosine 5'-triphosphate (ATP) 4 mmol/L, Magnesium 2 mmol/L, Hexokinase (Yeast) >2000 U/L, Glucose-6-phosphate dehydrogenase (G-6-PD) (Leuconostoc mesenteroides) >4000 U/L and buffer, stabilizers and preservatives.

ACE Ion Selective Electrode (ISE) Module

The Ion-Selective Electrode (ISE) module includes a sodium electrode, a potassium electrode, a chloride electrode, a reference electrode, a cleaning solution and two calibrators (level 1 and 2).

The sodium electrode membrane is a crown ether liquid-membrane. The potassium electrode membrane is a valinomycin liquid-membrane. The chloride electrode membrane is a quaternary ammonium salts polymer membrane.

The ISE calibrator 1 and 2 which is included contains the following chemicals: sodium, potassium, chloride. ISE calibrators have been previously cleared in k933862.

J. Substantial Equivalence Information:

1. Predicate device name(s) and 510(k) numbers:

ACE Axcel Chemistry System: k113253
ACE Clinical Chemistry System – With ISE: k933862
ACE Glucose Reagent: k930104

2. Device comparison with predicate:

ACE Alera Clinical Chemistry System

Comparison of similarities and differences:

	Candidate Device	Predicate Device K113253 (ACE Axcel)
Intended Use	Clinical chemistry analyzer intended for the quantitative measurements of general chemistry assays. For use in clinical laboratories or physician office laboratories.	Same
Instrument Platform	ACE Alera Clinical Chemistry System	ACE Axcel Clinical Chemistry System
Method of measurements	Potentiometric (ISE) and photometric chemistries	Same
Calibration	same	Automatic
Calibration Stability	same	3 hrs. STAT READY, as required after 3 hrs. STANDBY. When solution lot numbers are changed, new electrodes are installed, major service is performed or a control shift warrants
Sample Volume	same	156 µL
ISE Type	same	Direct (undiluted)

ACE Ion Selective Electrode (ISE) Module
Comparison of similarities and differences:

	Candidate device	Predicate device ACE Clinical Chemistry System – With ISE (k933862)
Intended Use	For the quantitative measurements of sodium, potassium, and chloride in human serum	Same
Method	Potentiometric: Ion-selective electrode	Same
Sample Type	Serum and lithium heparin plasma	Serum
Expected Values	Na: 136-145 mmol/L K: 3.5-5.1 mmol/L Cl: 98-`107 mmol/L	Same
Measuring range	Na 40-205 mmol/L K 1.5-15 mmol/L Cl 50-200 mmol/L	Same

ACE Glucose Reagent
Comparison of similarities and differences:

	Candidate Device	Predicate Device k930104 (ACE glucose reagent)
Intended Use	For the quantitative measurement of glucose in human serum	Same
Method	Photometric	Same
Sample Type	Serum and lithium heparin plasma	Serum
Expected value	70-105 mg/dL	Same
Measuring range	4-750 mg/dL	3-750 mg/dL

K. Standard/Guidance Document Referenced:

CLSI Guideline EP05-A2: Evaluation of Precision Performance of Quantitative Measurement Methods

CLSI Guideline EP06-A: Evaluation of the Linearity of Qualitative Measurement Methods

CLSI Guideline EP07-A2: Interference Testing in Clinical Chemistry

CLSI Guideline EP09-A2: Method Comparison and Bias Estimation Using Patient Samples

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

CLSI Guideline EP17-A: Protocols for Determination of Limits of Detection and Limits of Quantitation

L. Test Principle:

ACE Glucose Reagent

Glucose in serum reacts with adenosine triphosphate (ATP) in the presence of hexokinase (HK) and magnesium with the formation of glucose-6-phosphate (G-6-P) and adenosine diphosphate (ADP). Glucose-6-phosphate dehydrogenase (G-6-PD) catalyzes the oxidation of glucose-6-phosphate with NAD^+ to form 6-phosphogluconate and NADH. NADH absorbs strongly at 340 nm, whereas NAD^+ does not. The total amount of NADH formed is proportional to the initial amount of glucose present. The rate of increase in absorbance, monitored bichromatically at 340 nm/450 nm, is directly proportional to the glucose concentration in the sample.

ACE Ion Selective Electrode (ISE) Module

The sodium, potassium and chloride are measured using ion-selective electrodes. Each electrode uses ion-specific membrane to measure the difference in ionic concentration between an inner electrolyte solution and the sample. The difference causes an electro-chemical potential to form on the membrane of the active electrode. The measured voltage difference of the sample and CAL A are used to determine the ion concentration in the sample. Two solutions contained in the ISE reagent pack CAL A and CAL B are used to perform a two-point calibration of the ion selective electrodes (ISE)

M. Performance Characteristics:

1. Analytical performance:

a. Precision/Reproducibility:

In-house precision studies were conducted on the ACE Alera Clinical Chemistry System following CLSI guidance document EP05-A2. Three levels of human serum samples were run 2 times per run, 2 runs per day, for a total of 22 days (n = 88 measurements/sample level). Results are summarized below.

Precision (SD, %CV)			
Glucose	**Mean (mg/dL)**	**Within-Run**	**Total**
Serum Low	62	0.6, 0.9%	0.8, 1.3%
Serum Mid	121	1.2, 1.0%	1.5, 1.3%
Serum High	366	6.4, 1.8%	6.9, 1.9%

Sodium	**Mean (mmol/L)**	**Within-Run**	**Total**
Serum Low	111.2	0.59, 0.5%	0.93, 0.8%
Serum Mid	139.0	0.80, 0.6%	0.87, 0.6%
Serum High	159.9	0.38, 0.2%	0.90, 0.6%
Potassium	**Mean (mmol/L)**	**Within-Run**	**Total**
Serum Low	2.2	0.04, 1.6%	0.05, 2.4%
Serum Mid	4.0	0.07, 1.8%	0.07, 1.8%
Serum High	7.9	0.07, 0.9%	0.11, 1.4%
Chloride	**Mean (mmol/L)**	**Within-Run**	**Total**
Serum Low	75.0	0.80, 1.1%	1.50, 2.0%
Serum Mid	99.3	0.75, 0.8%	0.87, 0.9%
Serum High	119.3	0.45, 0.4%	1.10, 0.9%

Additional precision studies were conducted at 3 Physician Office Laboratories (POL) with trained operators typically found in these settings, following CLSI guidance document EP5-A2. Three samples each of low, mid and high analyte serum were run on the ACE Alera Clinical Chemistry Systems in duplicate, for 5 days at 2 runs per day, both in-house and at 3 POL sites (Per site, N=40; 20 replicates per decision level per instrument system).

Glucose		**ACE Alera SD (mg/dL) or %CV**		
Lab	**Sample**	**Mean (mg/dL)**	**Within-Run**	**Total**
In-House	1	62.5	1.2 SD	1.3 SD
			1.9%	2.1%
POL 1	1	64.3	1.1 SD	1.5 SD
			1.7%	2.3%
POL 2	1	65.3	0.6 SD	0.9 SD
			0.9%	1.3%
POL 3	1		0.5 SD	1.0 SD

		64.7	0.8%	1.5%
In-House	2	300.0	2.4 SD	4.0 SD
			0.8%	1.3%
POL 1	2	292.1	4.7 SD	6.6 SD
			1.6%	2.3%
POL 2	2	296.6	4.6 SD	8.1 SD
			1.6%	2.7%
POL 3	2	294.2	2.1 SD	4.3 SD
			0.7%	1.5%
In-House	3	529.8	5.2 SD	12.6 SD
			1.0%	2.4%
POL 1	3	500.7	11.5 SD	13.8 SD
			2.3%	2.8%
POL 2	3	513.6	12.4 SD	13.9 SD
			2.4%	2.7%
POL 3	3	508.8	4.2 SD	6.5 SD
			0.8%	1.3%

Sodium		**ACE Alera SD (mmol/L) or %CV**		
Lab	**Sample**	**Mean (mmol/L)**	**Within-Run**	**Total**
In-House	1	107.5	0.80 SD	1.50 SD
			0.7%	1.4%
POL 1	1	108.4	0.93 SD	1.44 SD
			0.9%	1.3%
POL 2	1	108.1	0.94 SD	1.16 SD
			0.9%	1.1%
POL 3	1	107.0	0.56 SD	0.98 SD
			0.5%	0.9%
In-House	2	149.2	0.60 SD	0.70 SD
			0.4%	0.5%
POL 1	2	148.7	1.41 SD	1.72 SD
			0.9%	1.2%
POL 2	2	146.1	0.56 SD	0.80 SD
			0.4%	0.5%
POL 3	2	147.6	0.95 SD	0.95 SD
			0.6%	0.6%
In-House	3	197.1	1.80 SD	2.10 SD
			0.9%	1.1%
POL 1	3	193.7	1.33 SD	2.74 SD

			0.7%	1.4%
			0.80 SD	1.31 SD
POL 2	3	189.4	0.4%	0.7%
			1.09 SD	1.09 SD
POL 3	3	192.7	0.6%	0.6%

Potassium		**ACE Alera SD (mmol/L) or %CV**		
Lab	**Sample**	**Mean (mmol/L)**	**Within-Run**	**Total**
In-House	1	3.70	0.06 SD	0.06 SD
			1.6%	1.7%
POL 1	1	3.73	0.07 SD	0.08 SD
			1.8%	2.2%
POL 2	1	3.77	0.06 SD	0.07 SD
			1.7%	1.8%
POL 3	1	3.73	0.05 SD	0.06 SD
			1.3%	1.6%
In-House	2	6.56	0.13 SD	0.14 SD
			2.0%	2.1%
POL 1	2	6.89	0.13 SD	0.16 SD
			1.8%	2.4%
POL 2	2	6.70	0.08 SD	0.09 SD
			1.2%	1.3%
POL 3	2	6.67	0.05 SD	0.10 SD
			0.8%	1.4%
In-House	3	9.73	0.09 SD	0.19 SD
			0.9%	2.0%
POL 1	3	10.36	0.08 SD	0.19 SD
			0.8%	1.8%
POL 2	3	10.04	0.04 SD	0.19 SD
			0.4%	1.9%
POL 3	3	9.92	0.15 SD	0.22 SD
			1.5%	2.2%

Chloride		**ACE Alera SD (mmol/L) or %CV**		
Lab	Sample	Mean (mmol/L)	Within-Run	Total
In-House	1	77.3	0.50 SD	1.20 SD
			0.6%	1.6%
POL 1	1	78.1	0.76 SD	1.30 SD
			1.0%	1.7%

			0.89 SD	1.24 SD
POL 2	1	78.4	1.1%	1.6%
			0.48 SD	0.54 SD
POL 3	1	78.1	0.6%	0.7%
In-House	2	108.3	1.20 SD	1.30 SD
			1.1%	1.2%
			1.42 SD	1.42 SD
POL 1	2	109.0	1.3%	1.3%
			0.69 SD	0.85 SD
POL 2	2	107.7	0.6%	0.8%
			0.60 SD	0.67 SD
POL 3	2	108.2	0.6%	0.6%
In-House	3	143.4	1.70 SD	1.80 SD
			1.2%	1.3%
			1.11 SD	2.04 SD
POL 1	3	142.8	0.8%	1.4%
			0.73 SD	1.69 SD
POL 2	3	141.2	0.5%	1.2%
			0.61 SD	0.75 SD
POL 3	3	142.2	0.4%	0.5%

Another precision study was performed in-house using 3 different lithium heparin plasma samples over a period of 5 days. All samples were tested twice a day in duplicate on the ACE, ACE Alera, and ACE Axcel Clinical Chemistry Systems. The within-run and total precision results are summarized in the tables below.

1. For ACE system:

Assay	Sample	Mean	With-run SD	Within-run CV	Total SD	Total CV
Sodium (mmol/L)	1	140.8	0.56	0.4%	0.62	0.4%
	2	166.9	0.74	0.4%	0.98	0.6%
	3	193.4	0.47	0.2%	1.29	0.7%
Potassium (mmol/L)	1	3.35	0.03	0.9%	0.05	1.5%
	2	6.42	0.08	1.2%	0.08	1.2%
	3	9.57	0.05	0.5%	0.14	1.4%
Chloride (mmol/L)	1	116.3	0.46	0.4%	0.73	0.6%
	2	146.1	0.74	0.5%	1.25	0.9%
	3	175.2	0.45	0.3%	1.45	0.8%
Glucose (mg/dL)	1	78	1.3	1.7%	1.5	2.0%
	2	362	1.9	0.5%	3.6	1.0%
	3	632	8.9	1.4%	10.7	1.7%

2. For ACE Alera system:

Assay	Sample	Mean	With-run SD	Within-run CV	Total SD	Total CV
Sodium (mmol/L)	1	141.1	0.95	0.7%	0.97	0.7%
	2	166.6	0.89	0.5%	1.12	0.7%
	3	192.8	0.46	0.2%	1.54	0.8%
Potassium (mmol/L)	1	3.36	0.03	0.9%	0.04	1.2%
	2	6.4	0.08	1.3%	0.08	1.3%
	3	9.52	0.04	0.4%	0.17	1.8%
Chloride (mmol/L)	1	116.5	0.68	0.6%	0.76	0.6%
	2	145.1	0.79	0.5%	1.69	1.2%
	3	173.0	0.47	0.3%	2.84	1.6%
Glucose (mg/dL)	1	78	1.6	2.0%	1.6	2.1%
	2	358	2.3	0.7%	2.8	0.8%
	3	625	5.1	0.8%	8.5	1.4%

3. For ACE Axcel system:

Assay	Sample	Mean	With-run SD	Within-run CV	Total SD	Total CV
Sodium (mmol/L)	1	140.1	0.38	0.3%	0.62	0.4%
	2	166.6	0.82	0.5%	1.36	0.8%
	3	193.3	0.5	0.3%	2.26	1.2%
Potassium (mmol/L)	1	3.31	0.02	0.7%	0.04	1.3%
	2	6.4	0.07	1.1%	0.09	1.3%
	3	9.56	0.04	0.4%	0.17	1.8%
Chloride (mmol/L)	1	115.9	0.48	0.4%	0.57	0.5%
	2	145.5	0.76	0.5%	1.38	0.9%
	3	174.3	0.42	0.2%	2.43	1.4%
Glucose (mg/dL)	1	79	0.4	1.5%	0.5	0.6%
	2	363	1.9	0.5%	2.0	0.5%
	3	638	2.3	0.4%	3.7	0.6%

b. Linearity/assay reportable range:

Linearity was confirmed for ISE and Glucose assays on the ACE Alera Clinical Chemistry System by spiking serum samples with a high concentration of analyte, then diluting the spiked sample with saline or water to obtain at least 7 levels that span the measuring range of each assay. The assigned value of the highest sample was set to its mean value. The assigned values of the other levels were calculated by multiplying the mean value by the dilution ratios obtained from the manufacturer. Each level was tested in triplicate. The linear regression correlation between the expected values and the measured values is summarized below:

Analyte tested	Linear regression	r^2
Glucose (mg/dL)	y = 0.979x – 0.51	0.9999
Na (mmol/L)	y = 1.017x – 2.95	0.9990
K (mmol/L)	y = 1.035x – 0.60	0.9992
Cl (mmol/L)	y = 1.013x – 1.35	0.9994

The linearity data provided by the sponsor support the following reportable range claims:

Analyte tested	Assay range
Glucose (mg/dL)	4 - 750
Na (mmol/L)	40 – 205
K (mmol/L)	1.5 – 15
Cl (mmol/L)	50 - 200

Automatic dilution study:

The ACE Alera Clinical Chemistry System can perform automatic 1:3 dilutions of samples that exceed the upper limit of the glucose assay. To examine the accuracy of the auto-dilution function for the ACE Glucose Reagent, serum samples were spiked with high concentrations of glucose and were then either run directly on each of the ACE systems or they were manually diluted 1:3 using system diluent (3 samples per instrument system in triplicate). The results from the auto-dilution and the manually diluted samples, run on the same ACE systems, were compared. All samples recovered within 10% recovery. The auto-dilution function is not available for ISE analytes.

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

Traceability and stability: The ISE calibrator material was previously cleared under k933862 and the glucose calibrator was previously cleared under k930104.

d. Detection limit:

The sponsor performed a detection limit study for glucose on the ACE Alera Clinical Chemistry System, based on a modified protocol according to the CLSI EP17-A. For Na, K and Cl detection limits, please refer to their linearity studies, as the sponsor determined that the limits of detection are defined by the linear range studies for these assays on the ACE Alera Clinical Chemistry System.

Limit of Blank (LoB) determination was based on 60 replicate glucose measurements of 5 blank samples (human serum albumin) on 2 ACE Alera Clinical Chemistry Systems, and 1 lot of assay reagents. The limit of blank, as determined by the upper 95th percentile was 0.80 mg/dL for the ACE Alera Clinical Chemistry System.

Limit of Detection (LoD) determination was based on 60 replicate glucose measurements of 5 low human serum-based samples on 2 ACE Alera Clinical Chemistry System, and 1 lot of assay reagents. The limits of detection were calculated using the determined LoB value and pooled SD values from LoD samples. The sponsor claimed that the LoD for serum samples

on ACE Alera Clinical Chemistry System was 1.18 mg/dL.

Limit of Quantitation (LoQ) determination was based on inter-assay precision of 20% for 40 replicate measurements of 5 low serum samples, per day for 5 days, on 1 ACE Alera Clinical Chemistry System. The LoQ was determined to be 2.88 mg/dL for the ACE Alera system.

The sponsor claimed the following measuring range:

Analyte tested	**Assay range**
Glucose (mg/dL)	4 - 750
Na (mmol/L)	40 – 205
K (mmol/L)	1.5 – 15
Cl (mmol/L)	50 - 200

e. Analytical specificity:

Interference studies were performed according to CLSI guidance document EP-7A to determine the effects from potential interferents on the ACE Glucose and ISE assays. Various concentrations of interferents were spiked into serum pools containing glucose, sodium, potassium and chloride at normal and elevated concentrations. All samples were tested in triplicate on the ACE Alera system. Seven levels were tested for each interferent. The sponsor states that interference is considered to be non-significant if the bias between the tested and control samples are within ±10% for each of the analytes.

The analytical specificity study results are summarized as follows:

No Significant Interference at or below the listed concentration (mg/dL)				
	Glucose	Sodium	Potassium	Chloride
Bilirubin	26	50	50	50
Ascorbic Acid	6	6	6	6
Hemoglobin	1000	1000	125	1000
Intralipid	104	125	125	125
Triglycerides	525	656	420	420

Since lipemia affects all test results and hemolysis affects K results, the sponsor has the following limitations in the labeling:

> "Do not use hemolyzed samples for potassium since significant hemolysis may increase K^+ concentration because of high levels of K^+ in erythrocytes."
>
> "Do not use lipemic samples."

f. Assay cut-off:

Not applicable.

2. Comparison studies:

a. Method comparison with predicate device:

Method comparison studies were completed at 3 POC sites following CLSI document EP9-A2. Samples were run on the ACE Clinical Chemistry System at Alfa Wassermann and the results were compared against those gathered on ACE Alera Clinical Chemistry Systems at 3 Physician Office Labs. For each test method, at least 41 determinations were made in singlicate for serum samples drawn from the same individuals on each platform. To test across the assay reportable ranges, additional sets of 4 samples and 6 samples were either spiked with analyte or diluted with saline for the Glucose and ISE POL studies, respectively. The following chart summarizes the POL method comparison studies:

Glucose	**ACE (in-house) vs. ACE Alera (POL)**		
	POL 1	POL 2	POL 3
N	46	46	46
Range (mg/dL)	22-625	22-625	22-625
Slope	1.015	1.005	0.988
Intercept	0.1	3.1	3.2
Correlation Coefficient	0.9993	0.9995	0.9993

Sodium	**ACE (in-house) vs. ACE Alera (POL)**		
	POL 1	POL 2	POL 3
N	42	42	42
Range (mmol/L)	51-202	51-202	51-202
Slope	1.025	1.021	1.044
Intercept	-1.74	-2.92	-6.27
Correlation Coefficient	0.9974	0.9958	0.9979

Potassium	**ACE (in-house) vs. ACE Alera (POL)**		
	POL 1	POL 2	POL 3
N	43	43	43
Range (mmol/L)	1.8-13.7	1.8-13.7	1.8-13.7
Slope	1.032	1.008	0.984
Intercept	-0.108	-0.054	0.150
Correlation Coefficient	0.9983	0.9971	0.9942

Chloride	**ACE (in-house) vs. ACE Alera (POL)**		
	POL 1	POL 2	POL 3

N	41	41	41
Range (mmol/L)	59-187	59-187	59-187
Slope	1.004	1.000	1.006
Intercept	0.96	0.29	0.16
Correlation Coefficient	0.9972	0.9956	0.9946

b. Matrix comparison:

Matrix comparison studies were completed following CLSI guidance document EP9-A2. Samples were tested on the ACE, ACE Alera and ACE Axcel Clinical Chemistry Systems. At least 50 determinations were made in singlicate for paired serum and lithium heparin plasma samples drawn from the same individuals. Of these samples, up to 10 were either spiked with analyte or diluted with water to allowing for testing across the assay ranges.

The following chart summarizes the matrix comparison studies:

Reagent	**Range**	**ACE** **Serum vs. Plasma**
Sodium 53 pairs	75-202 mmol/L	Slope: 0.979 Intercept: 3.12 Correlation: 0.9850
Potassium 53 pairs	1.8-13.9 mmol/L	Slope: 0.984 Intercept: 0.133 Correlation: 0.9948
Chloride 55 pairs	53-183 mmol/L	Slope: 0.984 Intercept: 2.26 Correlation: 0.9902
Glucose 51 pairs	15-707 mg/dL	Slope: 1.011 Intercept: -2.0 Correlation: 0.9993

Reagent	**Range**	**ACE Alera** **Serum vs. Plasma**
Sodium 54 pairs	77-203 mmol/L	Slope: 0.980 Intercept: 3.46 Correlation: 0.9854
Potassium 55 pairs	1.9-12.5 mmol/L	Slope: 0.969 Intercept: 0.187 Correlation: 0.9949
Chloride 55 pairs	53-183 mmol/L	Slope: 1.000 Intercept: 0.89 Correlation: 0.9906
Glucose 50 pairs	15-740 mg/dL	Slope: 0.997 Intercept: 0.8 Correlation: 0.9988

Reagent	Range	ACE Axcel Serum vs. Plasma
Sodium 56 pairs	65-205 mmol/L	Slope: 1.005 Intercept: -2.13 Correlation: 0.9976
Potassium 58 pairs	1.7-12.3mmol/L	Slope: 1.024 Intercept: -0.096 Correlation: 0.9941
Chloride 56 pairs	61-175 mmol/L	Slope: 1.000 Intercept: -0.69 Correlation: 0.9960
Glucose 55 pairs	24-747 mg/dL	Slope: 1.003 Intercept: -6.6 Correlation: 0.9985

The sponsor concluded that Lithium heparin plasma is acceptable to be used with the ISE and glucose assays.

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 for serum and plasma are provided in the labeling according to literature as follows:

   Na^+: 136 – 145 mM or mEq/L
   K^+: 3.5 – 5.1 mM or mEq/L
   Cl^-: 98 – 107 mM or mEq/L
   Glucose: 70 – 105 mg/dL

Tietz, N. W. (Ed.), *Clinical Guide to Laboratory Tests*, 3rd Ed., WB Saunders Co., Philadelphia, PA (1995).

Burtis, C. A., Ashwood, E. R. (Eds.) *Tietz Fundamentals of Clinical Chemistry*, 4th ed., WB Saunders Co., Philadelphia, PA (1996).

N. Instrument Name:

ACE Alera Clinical Chemistry System

O. System Descriptions:

1. Modes of Operation:

   This instrument is capable of testing several assays via self-contained reagent bottles. The instrument identifies the assay through reading a dot code label on the bottom of each reagent bottle.

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:

   Barcoding or manual entry

4. Specimen Sampling and Handling:

   Samples are manually placed on the instrument either by sample tube or sample cup. The system can run an individual sample or a batch of samples. Once tested the samples are removed.

5. Calibration:

   On demand calibration. It is recommended to perform a calibration measurement after installing a new or fresh bottle of reagent and/or intervals that are defined for a particular test. It is recommended to recalibrate ISEs after installing a new lot of calibration solution. ISE calibration is required every 3 hours or when quality control results fall outside the established range after replacing electrode, and after ISE cleaning maintenance.

6. Quality Control:

   Controls are loaded onto the instrument manually by the user into the sample wells and are run automatically by the instrument. Labeling recommends two levels of controls run daily.

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.