

**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY TEMPLATE**

A. 510(k) Number:

k151113

B. Purpose for Submission:

New Device

C. Measurand:

Calcium

D. Type of Test:

Quantitative, colorimetric chemistry test

E. Applicant:

ELITech Clinical Systems

F. Proprietary and Established Names:

ELITech Clinical Systems CALCIUM ARSENAZO

G. Regulatory Information:

Product Code	Classification	Regulation Section	Panel
CJY	Class II	21 CFR § 862.1145 Calcium Test System	Clinical Chemistry (75)

H. Intended Use:

1. Intended use(s):

See indications for use below

2. Indication(s) for use:

ELITech Clinical Systems CALCIUM ARSENAZO is intended for the quantitative in vitro diagnostic determination of total calcium in human serum, plasma and urine using ELITech Clinical Systems Selectra Pro Series Analyzers. It is not intended for use in Point of Care settings.

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).

3. Special conditions for use statement(s):

For *in vitro* diagnostic use only

For prescription use only

4. Special instrument requirements:

Selectra ProM Analyzer

I. Device Description:

The ELITech Clinical Systems Calcium Arsenazo kit reagents are one reagent systems. The kit consists of a mono-reagent R whose composition is: 100 mmol/L MES buffer (pH 6.50), 200 µmol/L Arsenazo III.

J. Substantial Equivalence Information:

1. Predicate device name(s):

Horiba ABX PENTRA Calcium

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

k123171

3. Comparison with predicate:

Similarities and Differences		
Item	Candidate Device Calcium Arsenazo	Predicate Device ABX PENTRA Calcium
Intended Use	Same	The reagent is for the quantitative determination of calcium concentration.
Measurand	Same	Calcium
Assay Method	Same	Colormetric
Measuring Range	Serum, Plasma : 5.00 – 15.00 mg/dL Urine: 1.50 – 18.00 mg/dL	Serum, Plasma : 4.00 – 18.05 mg/dL Urine: 0.64 – 18.05 mg/dL
Matrix	Same	Serum, plasma and urine
Instrument platform	Selectra Pro M	ABX Pentra 400

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

- CLSI Guideline, EP5-A2 Evaluation of Precision Performance of Clinical Chemistry Devices – Second Edition
- CLSI Guideline, EP9-A2 Method Comparison and Bias Estimation Using Patient Samples – Second Edition
- CLSI Guideline, EP6-A Evaluation of the Linearity of Quantitative Measurement Procedures: A Statistical Approach; Approved Guideline
- CLSI Guideline, EP7-A2 Interference Testing in Clinical Chemistry; Approved Guideline – Second Edition
- CLSI Guideline, EP17-A Protocols for Determination of Limits of Detection and Limits of Quantitation; Approved Guideline
- FR EN 13640:2002 Stability Testing of In Vitro Diagnostic Reagents
- CLSI Guideline, EP9-A2 Method Comparison and Bias estimation Using Patient Samples; Approved Guideline

L. Test Principle:

The assay utilizes a dye binding procedure in which calcium forms a blue-purple complex with Arsenazo under acidic condition. Calcium reacts with Arsenazo in an acidic solution to form a blue-purple colored complex. The intensity of color produced is directly proportional to the calcium concentration in the sample.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. *Precision/Reproducibility:*

Within run and total precision studies were performed according to CLSI EP5. Studies were performed by conducting two runs per day, two measures per run, for 3 levels of serum and urine samples, on 2 Selectra ProM instruments for 20 operating days. Results are presented in the tables below.

	N	Sample Mean (mg/dL)	Within Run %CV	Total %CV
Serum (mg/dL)	80	8.28	1.1	1.7
	80	10.32	0.5	1.4
	80	12.96	0.5	1.0

	N	Sample Mean (mg/dL)	Within Run %CV	Total %CV
Urine (mg/dL)	80	4.53	1.3	1.8
	80	10.89	0.5	1.2
	80	17.51	0.3	0.8

b. *Linearity/assay reportable range:*

Serum:

Linearity was evaluated according to CLSI EP6-A by comparing observed versus expected values for 11 equally-spaced serum samples. Samples were prepared from high (15.35 mg/dL) and low (4.94 mg/dL) analyte concentration serum pools. Each sample was evaluated in triplicate on the Selectra ProM instrument.

Urine:

Linearity was evaluated by mixing a high (18.60 mg/dL) and low (1.45 mg/dL) urine concentrations to obtain 11 levels. Each sample was evaluated in triplicate on the Selectra ProM instrument.

Linear regression results from these studies are found in the table below:

	Slope	Intercept	R ²	Standard Error	Concentration Ranges tested
Serum	1.0173	-0.2048	0.9976	0.19	4.94 to 15.35 mg/dL
Urine	1.0003	-0.1174	0.9983	0.25	1.45 to 18.60 mg/dL

The linearity supports the sponsor's claimed reportable range of 5.00 – 15.00 mg/dL for serum and 1.50 – 18.00 mg/dL for urine.

Automatic dilution of 1: 5 by the instrument is available for sample that has concentration greater than the measuring range.

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

ELITech Clinical Systems ELICAL 2 calibrator was cleared under k132399.

Traceability for calcium is to NIST SRM 956c materials.

d. Detection limit:

Limit of Blank (LoB), Limit of detection (LoD), and limit of quantification (LoQ) were determined according to CLSI EP17-A with the Selectra ProM. LoB was determined using a blank sample tested over multi-runs over multi-days. For LoD and LoQ, testing using serum samples and urine samples was conducted over multiple days, with one run across two instruments, and with two reagent lots. The LoB, LoD, and LoQ results are as follows:

	Serum (mg/dL)	Urine (mg/dL)
LoB	0.04	0.09
LoD	0.04	0.15
LoQ	5.00	1.50

The sponsor claimed the following measuring ranges: 5.00 – 15.00 mg/dL for serum and 1.50 – 18.00 mg/dL for urine

e. *Analytical specificity:*

Interferences due to unconjugated bilirubin, conjugated bilirubin, triglycerides, ascorbic acid, acetylsalicylic acid and acetaminophen were investigated following the recommended sample levels in CLSI EP07-A2 protocol. Two serum sample pools at two different calcium concentrations (8.0 and 12.0 mg/dL) and two urine pools at two different calcium concentrations (4.0 and 16.0 mg/dL) were used for the study. Sponsor defines non-significant interference as bias of <10% between the spiked and unspiked samples. The results of the highest concentration tested without significant interference are summarized in the table below.

Serum:

Interferent	Test range
Unconjugated bilirubin	up to 30.0 mg/dL
Conjugated bilirubin	up to 29.5 mg/dL
Hemoglobin	up to 500 mg/dL
Triglycerides	up to 1726 mg/dL
Magnesium	up to 12.0 mg/dL
Ascorbic acid	up to 20 mg/dL
Acetylsalicylic Acid	up to 200 mg/dL
Acetaminophen	up to 30 mg/dL

Urine:

Interferent	Test range
Conjugated bilirubin	up to 29.5 mg/dL
Hemoglobin	up to 500 mg/dL
Ascorbic acid	up to 10 mg/dL
Urea	up to 5000 mg/dL
Uric Acid	up to 100 mg/dL
Magnesium	up to 10 mg/dL
pH	2.5 to 6.0

Sponsor includes the following statement and references in the labeling:

“Other compounds may interfere. Users should refer to the following literature references”

1. Berth, M. & Delanghe, J. Protein precipitation as a possible important pitfall in the clinical chemistry analysis of blood samples containing monoclonal immunoglobulins: 2 case reports and a review of literature, *Acta Clin Belg.*, (2004), 59, 263.
2. Young, D. S., *Effects of preanalytical variables on clinical laboratory tests*, 2nd Ed., AACC Press, (1997).
3. Young, D. S., *Effects of drugs on clinical laboratory tests*, 4th Ed., AACC Press, (1995).

f. Assay cut-off:

Not applicable

2. Comparison studies:

a. Method comparison with predicate device:

Serum Method Comparison:

Two sets of method comparison studies, serum and urine, were performed according to the CLSI EP9-A2 guideline. The serum study was completed with 106 human serum samples (5 spiked, 5 diluted and 96 unaltered samples) spanning the linear range of the assay. The urine study was completed with 52 native samples spanning the linear range of the assay. Each serum and urine sample was analyzed in singlet using the Selectra ProM analyzer (test method) and in duplicate on the predicate ABX Pentra Calcium AS CP reagent on an ABX Pentra analyzer. Comparison of individual test values versus mean predicate values yielded the following results:

Matrix	Slope	Intercept	R ²	Conc. Range Tested
Serum	0.949	0.41	0.986	5.07 – 14.79 mg/dL
Urine	0.936	0.20	0.995	1.50 – 17.14 mg/dL

b. Matrix comparison

73 paired serum and plasma patient specimens (in lithium heparin samples, ranging from 5.19 to 14.38 mg/dL), were tested on ELITech Clinical Systems Selectra ProM Analyzer according to CLSI protocol EP09-A2. 10% of the samples were either diluted (5) or spiked (2) to achieve the full range for comparison.

Regression analysis: $y = 0.976x + 0.26$, $R^2 = 0.993$

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 ranges are provided in the labeling from literature as follows:

Serum/ Plasma⁽¹⁾:

8.6 - 10.3 mg/dL

Urine⁽²⁾ (for a urinary volume of 1.5 L per day):

100 – 300 mg/24h*

1. Wu, A.H.B., Tietz Clinical Guide to Laboratory Test, 4th Ed., (W.B. Saunders Company), (2006), 66.

2. Endres, D.B., Rude, R.K., Disorders of Bone, Tietz Fundamentals of Clinical Chemistry, 6th Ed., Burtis, C.A., Ashwood, E.R., Bruns, D.E. (Saunders), (2008), 711.

Each laboratory should establish and maintain its own reference values. The values given are used as guidelines only.

N. Proposed Labeling:

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

O. Conclusion:

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