

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

A. 510(k) Number:

k062855

B. Purpose for Submission:

New Device

C. Measurand:

Calcium

D. Type of Test:

Quantitative

E. Applicant:

Abbott Laboratories

F. Proprietary and Established Names:

Abbott Clinical Chemistry Architect/Aeroset Calcium

G. Regulatory Information:

1. Regulation section:

21 CFR § 862.1145 Calcium Test System

2. Classification:

Class II

3. Product code:

CJY

4. Panel:

Clinical Chemistry

H. Intended Use:

1. Intended use(s):

A calcium test system is a device intended to measure the total calcium level in serum, plasma, and urine.

2. Indication(s) for use:

A calcium test system is a device intended to measure the total calcium level in serum, plasma, and 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).

3. Special conditions for use statement(s):

Prescription Use Only

4. Special instrument requirements:

Abbott Architect / Aeroset analyzers only

I. Device Description:

The Abbott Clinical Chemistry Architect/Aeroset Calcium assay is supplied as a liquid, ready-to-use single reagent kit containing Arsenazo-III dye at a concentration of 348 $\mu\text{mol/L}$ and sodium acetate at a concentration of 90 mmol/L .

The 41 mL reagent will produce approximately 10,000 tests and the 74 mL reagent will produce approximately 19,000 tests.

J. Substantial Equivalence Information:

1. Predicate device name(s):

Abbott Clinical Chemistry Calcium assay

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

k981578

3. Comparison with predicate:

Similarities		
Item	Device	Predicate
Analyte Measured	Calcium	Same
Intended Use	The Calcium assay is used for the quantitation of Calcium in human serum, plasma, or urine.	Same
Assay Principle	Arsenazo-III dye reacts with calcium in an acid solution to form a blue-purple complex. The color developed is measured at 660 nm and is proportional to the calcium concentration in the sample.	Same
Detection of Analyte	Endpoint	Same
Matrices	Serum, plasma, or urine	Same
Reference Ranges	Serum/Plasma (mg/dL): <ul style="list-style-type: none"> Cord 8.2 to 11.2 Newborn <ul style="list-style-type: none"> -Premature 6.2 to 11.0 -0 to 10 days 7.6 to 10.4 -10 days to 24 months 9.0 to 11.0 Child, 2 to 12 years 8.8 to 10.8 Adult 8.4 to 10.2 Male > 60 years 8.8 to 10.0 Urine: 100 – 300 mg/day	Same
Analysis Medium	Aqueous solution	Same
Use of Calibrators	Yes	Yes
Use of Controls	Yes	Yes

Differences		
Item	Device	Predicate
Estimated number of tests per kit:	41 mL kit: 10,000 74 mL kit: 19,000	84 mL kit: 3, 032

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

CLSI Document EP5-A: Evaluation of Precision Performance of Clinical Chemistry Devices; Approved Guideline

CLSI Document EP9-A2: Method Comparison and Bias Estimation Using Patient Samples; Approved Guideline – Second Edition

CLSI Document EP10-A: Preliminary Evaluation of Quantitative Clinical Laboratory Methods; Approved Guideline – Second Edition

CLSI document NCCLS EP17-A: Protocols for Determination of Limits of Detection and Limits of Quantitation; Approved Guideline

L. Test Principle:

Arsenazo-III dye reacts with calcium in an acid solution to form a blue-purple complex. The color developed is measured at 660 nm and is proportional to the calcium concentration in the sample.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Precision/Reproducibility:

Serum: the total precision as well as the precision for each component of variation (between-day, between-run, and within-run) was estimated in accordance with CLSI Document EP5-A. A minimum of two control levels at normal and abnormal analyte concentrations were tested. These controls were evaluated over 20 days, two runs per day, and two replicates per run. Precision was reported as the total percent CV.

Urine: five day precision studies were conducted on the AEROSSET and ARCHITECT c8000 Systems in accordance with CLSI Document EP10-A. This study was intended to supplement data obtained from the twenty-day serum precision study and provides a limited assessment of the performance of the assay with the urine matrix. A minimum of two control levels at normal and abnormal analyte concentrations were tested. These controls were evaluated over five days, two runs per day, and five replicates per run. Precision was reported as the total %CV.

The precision of the Calcium assay is $\leq 3\%$ total CV for serum and urine.

b. *Linearity/assay reportable range:*

A minimum of nine samples at various concentrations spanning the desired linear range of the assay were run in a minimum of four replicates. At least one level was included which exceeded the desired linear range. The percent recovery for each sample was determined by dividing the mean observed result by the expected value. The sponsor's acceptable difference between the observed result and expected value was within $\pm 5\%$ or ± 0.2 mg/dL of the accepted values from 2 to 18 mg/dL and within $\pm 10\%$ of expected values from 18 to 24 mg/dL for serum and urine.

Data generated indicate Calcium is linear from 2 to 24 mg/dL for both serum and urine matrices.

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

The reagent calibration stability was determined by the recovery method on multiple lots of Calcium reagent. Fresh reagent was calibrated with fresh calibrators on Day 0. Control material and a prepared test sample near the linear high were analyzed on Day 0, 1, 7, 14, 15, 21, 29, 30, 31, and 33. The target for % recovery was 95 to 105% of the Day 0 results. All test points up to and including Day 33 met the target for % recovery. The resulting calibration stability claim is 30 days.

The reagent open onboard stability was determined by the recovery method on multiple lots of Calcium reagent. Fresh reagent was calibrated with fresh calibrators on Day 0. Control material and a prepared test sample near the linear high were analyzed on Day 0, 1, 7, 14, 15, 21, 29, 30, 31, and 33. All test points up to and including Day 33 met the target for % recovery. The open onboard stability claim is 30 days.

d. *Detection limit:*

To determine the Limit of Quantitation (LOQ), test levels near the linear low for the Calcium assay were run in replicates of 10, on three instruments, two runs per instrument. The limit of quantitation is the concentration of analyte which has imprecision less than or equal to 20% CV. The Limit of Detection (LOD) testing for Calcium was performed using a study design based on CLSI protocol EP17-A. The LOQ and LOD for calcium were calculated to be 1.0 and 0.5 mg/dL, respectively. When marketed, the assay will report values down to 2.0 mg/dL as the default setting. However, the sponsor states that some customers may require the information on LOD and LOQ and therefore the sponsor has elected to leave this information in the labeling.

e. Analytical specificity:

For serum samples, the sponsor evaluated the effects of bilirubin, hemoglobin, and Intralipid. For urine samples the sponsor evaluated the effects of acetic acid, ascorbate, boric acid, glucose, hydrochloric acid (HCl), nitric acid, and protein. Human serum samples at the medical decision level of the analyte and urine samples were spiked with various levels of interferents. A minimum of four replicates of each interferent level and four replicates of reference sample were run. The percent recovery was determined by dividing the mean result of each interferent sample by the mean result of the reference sample. According to the sponsor, the level of interference was considered acceptable if there was no more than $\pm 5\%$ difference between the interferent result and the reference result. Testing was performed using the AEROSET System.

The percent interference was within $\pm 5\%$ difference for serum samples containing 60 mg/dL bilirubin; 2,000 mg/dL hemoglobin; and 500 mg/dL Intralipid at Medical Decision Level 1 (7 to 8 mg/dL) and Medical Decision Level 2 (10 to 12 mg/dL).

The percent interference was within $\pm 5\%$ difference for urine samples containing 200 mg/dL ascorbate, 250 mg/dL boric acid, 500 mg/dL glucose, 2.5 mL/dL hydrochloric acid (6 N), and 50 mg/dL protein.

The percent interference was $> 10\%$ difference for urine samples containing 6.25 mL/dL acetic acid (8.5 N) and 5.0 mL/dL nitric acid (6 N).

f. Assay cut-off:

Not applicable.

2. Comparison studies:

a. Method comparison with predicate device:

A method comparison study was conducted in accordance with CLSI Document EP9-A2. As part of these studies, a total of 10 serum samples and 7 urine samples were spiked with calcium carbonate to generate high analytical levels. A linear regression analysis was performed comparing the results for each method with the following results:

AEROSET vs. predicate device – serum

One-hundred two serum samples ranging from 2.4 to 24.6 mg/dL were run and compared using the new reagent vs. the predicate:

Slope	0.96
Y-intercept	0.31

Corr. Coeff. 0.9993

AEROSET vs. predicate device – urine

Forty-seven urine samples ranging from 2.2 to 25.2 mg/dL were run and compared using the new reagent vs. the predicate:

Slope 0.95
Y-intercept 0.17
Corr. Coeff. 0.9994

ARCHITECT vs. predicate device – serum

Ninety-six serum samples ranging from 2.4 to 24.6 mg/dL were run and compared using the new reagent vs. the predicate:

Slope 0.96
Y-intercept 0.31
Corr. Coeff. 0.9989

ARCHITECT vs. predicate device – urine

Forty-seven urine samples ranging from 2.2 to 25.2 mg/dL were run and compared using the new reagent vs. the predicate:

Slope 0.94
Y-intercept 0.17
Corr. Coeff. 0.9986

ARCHITECT vs. AEROSET – serum

One hundred twenty-one serum samples ranging from 2.3 to 23.4 mg/dL were run and compared using the new reagent only:

Slope 1.00
Y-intercept 0.04
Corr. Coeff. 0.9979

ARCHITECT vs. AEROSET – urine

Forty-seven urine samples ranging from 2.2 to 23.9 mg/dL were run and compared using the new reagent only:

Slope 0.99
Y-intercept 0.00
Corr. Coeff. 0.9991

b. Matrix comparison:

To establish the compatibility of specimen collection tubes with the Calcium assay, fifteen samples were tested using each of the collection tubes to be evaluated. The serum tube used for the baseline was the glass tube; all other specimen tubes were plastic. The sponsor defined the acceptable differences as $\pm 5\%$ or ± 0.2 mg/dL difference from the serum baseline tube, whichever is greater. Testing was performed using the AEROSET System. Using this criteria, comparability with the plain glass serum tube was observed for lithium heparin (Li Hep) (with or without gel barrier), sodium heparin (Na Hep), and Serum Separator Tubes (SST) for the Calcium assay.

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):

4. Clinical cut-off:

Not applicable.

5. Expected values/Reference range:

SERUM/PLASMA

	<u>Range (mg/dL)</u>	<u>Range (mmol/L)</u>
Cord	8.2 to 11.2	2.05 to 2.80
Newborn		
Premature	6.2 to 11.0	1.55 to 2.75
0 to 10 days	7.6 to 10.4	1.90 to 2.60
10 days to 24 mo	9.0 to 11.0	2.25 to 2.75
Child 2 to 12 years	8.4 to 10.2	2.20 to 2.70
Adult	8.8 to 10.0	2.10 to 2.55
Male > 60 years	8.8 to 10.0	2.20 to 2.50

URINE

<u>Calcium in diet</u>	<u>Range (mg/day)</u>	<u>Range (mmol/day)</u>
Calcium-free	5 to 40	0.13 to 1.00
Low to average	50 to 150	1.25 to 3.75
Average (800 mg or 20 mmol/day)	100 to 300	2.50 to 7.50

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.