510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
ASSAY ONLY

I Background Information:

A 510(k) Number

K193001

B Applicant

Sentinel CH. SpA

C Proprietary and Established Names

Albumin BCP

D Regulatory Information

Product Code(s)	Classification	Regulation Section	Panel
CJW	Class II	21 CFR 862.1035 - Albumin Test System	CH - Clinical Chemistry

II Submission/Device Overview:

A Purpose for Submission:

New Device

B Measurand:

Albumin

C Type of Test:

Colorimetric

III Intended Use/Indications for Use:

A Intended Use(s):

See Indications for Use below.

Food and Drug Administration
10903 New Hampshire Avenue
Silver Spring, MD 20993-0002
www.fda.gov

B Indication(s) for Use:

The Albumin BCP assay is an in vitro diagnostic test used for the determination of albumin in human serum or plasma. Albumin measurements are used in the diagnosis and treatment of numerous diseases primarily involving the liver or kidneys.

The assay is intended for professional use only.

For In Vitro Diagnostic use only.

C Special Conditions for Use Statement(s):

Rx - For Prescription Use Only

D Special Instrument Requirements:

AU 680 Automatic Analyzer

IV Device/System Characteristics:

A Device Description:

Albumin BCP reagent is ready to use liquid reagent that is supplied in two configurations: fill volume of 20 mL in a 20 mL wedge or 50 mL in a 50 mL wedge, 6 wedges/kit. The ingredients in the reagent are acetate buffer (6.8%), stabilizer (4.38%), bromocresol purple (0.028%), detergent (0.045%), and sodium azide (<0.1%).

B Principle of Operation:

Albumin is measured using the colorimetric method where at pH 5.0 – 5.5, albumin reacts with bromocresol purple (BCP) forming a colored complex. The color intensity of this complex is proportional to the concentration of albumin present in the sample measurement as an endpoint reaction at 600/700nm.

V Substantial Equivalence Information:

A Predicate Device Name(s):

ADVIA Chemistry Albumin BCP Reagent (ALBP)

B Predicate 510(k) Number(s):

K132664

C Comparison with Predicate(s):

Device & Predicate Device(s):	K193001	K132664
Device Trade Name	Albumin BCP	ADVIA Chemistry Albumin BCP assay (ALBP)
General Device Characteristic Similarities		
Intended Use/Indications For Use	Determination of albumin in human serum and plasma.	Same
Measurement	Quantitative	Same
Specimen Types	Serum and Plasma	Same
Reagent	Single reagent	Same
Reagent	Liquid	Same
Principle	Colorimetric	Same
Standardization	ERM-DA 470k Reference Material	Same
General Device Characteristic Differences		
Analytical Assay Range	6.0 – 70.0 g/L	6.0 – 80.0 g/L
Reference value	35-52 g/L	34 -50 g/L

VI Standards/Guidance Documents Referenced:

- CLSI - EP05-A3: Evaluation of precision of Qualitative Measurement Procedures; Approved Guideline – Third Edition
- CLSI - EP06-A: Evaluation of linearity of Quantitative of Quantitative Measurement Procedures: A Statistical Approach; Approved Guideline
- CLSI – EP17-A2: Evaluation of detection Capability for Clinical Laboratory Measurement procedures; Approved Guidance -Second Edition
- CLSI – EP15-A3: User Verification of Precision and Estimation of Bias; Approved Guideline – Third Edition
- CLSI – EP25-A: Evaluation of Stability of In Vitro Diagnostic Reagents; Approved Guidance

VII Performance Characteristics (if/when applicable):

A Analytical Performance:

1. Precision/Reproducibility:

The precision was determined based on recommendations in CLSI EP05-A3 guideline.

Within run precision was established by testing two human serum-based control samples and one human serum sample pool. Each sample was tested in 20 replicates per run, for 3 runs for a total of 60 replicates per sample. Testing was performed on one AU680 Automatic analyzer using 3 reagent lots. The results for one representative lot are summarized in the table below.

Sample	N	Mean (g/L)	SD	%CV
Level 1	60	21.5	0.2	0.9
Level 2	60	35.6	0.3	0.7
Level 3	60	50.3	0.2	0.4

Within-laboratory precision was established by testing one human serum pool and two human serum-based control samples. Testing was performed for 20 days, 2 runs per day, 2 replicates per run for a total of 80 replicates per sample and a total of 240 total replicates. Testing was performed on one AU680 Automatic analyzer using four lots of reagents.

The results for one representative lot are summarized in the table below:

Sample	N	Mean (g/L)	Total %CV
Level 1	80	26.6	2.2
Level 2	80	40.7	2.1
Level 3	80	50.5	1.6

2. Linearity:

The linearity studies were performed following the CLSI EP06-A guideline. The studies were performed on one AU680 analyzer using serum samples spiked with human albumin. Low and high concentration pools were mixed and serial dilution samples (N=12) were prepared and tested in triplicate. The results from each of three reagent lots were compared to expected values. All three lots yielded similar results. The results of the linear regression analysis from one representative lot run are summarized below:

Sample range tested (g/L)	Slope	Intercept	Claimed measuring range (g/L)
4.2 – 78.7	1.0	0.999	6.0 -70.0

The linear regression results support the claimed measuring range.

3. Analytical Specificity/Interference:

Interference studies were performed according to the CLSI EP07 guideline.
Two serum pools were created with albumin concentrations of 35 g/L and 50 g/L, which were spiked with potentially interfering substances. Results from the spiked samples were compared to results from the same serum sample pools without addition of the potential interferents (control samples). Significant interference was defined as more than ± 10% bias from the test results of the spiked sample when compared to the control sample. The following substances did not cause interference at the concentrations listed below:

Interferent	Highest concentration tested that did not cause significant interference
Hemoglobin	2000 mg/dL
Unconjugated bilirubin	66 mg/dL
Conjugated bilirubin	66 mg/dL
Lipids (triglycerides	1200 mg/dL

The sponsor includes the following limitations for potential interferences in their labeling:

- CMPF (3-carboxy-4-methyl-5-propyl-2-furanpropanoic acid) present in sera of patients with renal failure has been reported to give falsely low albumin values.
- Negative bias of approximately 10 % has been observed on samples from patients undergoing hemodialysis. Samples from patients with elevated serum creatinine levels, or undergoing treatment with peritoneal dialysis, were unaffected.

4. Assay Reportable Range:

   6.0 – 70.0 g/L

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

   The assay is traceable to ERM-DA 470k Reference Material.

6. Detection Limit:

   Detection limit studies for were evaluated based upon CLSI EP17-A2 guideline.

   Limit of blank (LoB) studies were performed by testing 4 blank samples. Samples were tested in replicates of 5 over 3 days, using 3 lots of reagents for a total of 60 results per lot. LoB was defined as the highest result that can reasonably be expected from a blank sample for a given error probability with α=0.05. The highest LoB of the three lots is reported as the LoB in the labeling.

   Limit of detection (LoD) studies were performed by testing 4 serum pool samples with low analyte concentrations approximately 4-fold higher than the LoB. Samples were tested in replicates of 5 over 3 days, using 3 lots of reagents, for a total of 60 results per lot. LoD was calculated using the following equation: LoD= LoB + (SD x 1.652). The highest LoD of the three lots is reported as the LoD in the labeling.

   Limit of Quantitation studies were performed using 8 samples which were generated by diluting a sample with an album in concentration of 12 g/L. Each of the 8 samples were tested in 10 replicates over 3 days using 3 reagent lots for a total of 240 replicates per lot. The sponsor defines LoQ as the concentration corresponding to a coefficient of variation of 20%. The highest LoQ of the three lots is reported as the LoQ in the labeling.

   The results are summarized in the table below:

LoB	LoD	LoQ
0.3 g/L	0.8 g/L	1.5 g/L

7. Assay Cut-Off:
   Not applicable.

8. Accuracy (Instrument):
   Not applicable.

9. Carry-Over:
   Not applicable.

B Comparison Studies:

1. Method Comparison with Predicate Device:

   A method comparison study was performed by testing 128 serum samples spanning the entire claimed assay range. Eight samples were contrived. Each sample was run in duplicate on the predicate device (ADVIA Chemistry Albumin BCP on the Siemens ADVIA 2400) and singlicate on the candidate device (Albumin BCP on the AU680 Automatic analyzer). The singlicate test result from candidate test system was compared to the average of the results from the comparator method using Passing-Bablok analysis. The results are summarized in the table below:

Slope	Intercept	Correlation coefficient (r)	N	Sample concentration range tested (g/L)
0.94	1.01	0.992	128	7.8 – 67.1

2. Matrix Comparison:

   A matrix comparison study was performed to demonstrate lithium heparin plasma and K2EDTA plasma equivalency to serum. A total of seventy-seven matched sample pairs were tested. Results obtained with serum samples using Albumin BCP on one AU680 were compared results obtained from either lithium heparin plasma or K_2EDTA plasma samples. The table below summarizes the Passing-Bablok linear regression results:

Specimen Type	N	Slope	Intercept	r	Sample range tested (g/L)
Lithium heparin plasma	77	1.012	-0.3395	0.995	13.4 – 65.7
K_2EDTA plasma	77	1.00	-0.200	0.996	13.4 – 65.7

   The study results support the sponsor's claim that human serum and plasma (K_2EDTA and lithium heparin) are acceptable sample types to be used with this assay.

C Clinical Studies:

1. Clinical Sensitivity:

   Not applicable.

2. Clinical Specificity:

Not applicable.

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

Not Applicable.

D Clinical Cut-Off:

Not applicable.

E Expected Values/Reference Range:

Expected values for the Albumin BCP assay are cited from literature*:
Adults (< 60 years): 35 - 52 g/L

** Burtis CA, Ashwood ER, Bruns DE, editors. Tietz Textbook of Clinical Chemistry and Molecular Diagnostics, 5th ed. St. Louis, MO: Elsevier Saunders; 2012:2148*).

The sponsor recommends that each laboratory should establish its own reference ranges.

F Other Supportive Instrument Performance Characteristics Data:

Not applicable.

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.