February 7, 2018

Sebia
Karen Anderson
Director of Technical and Regulatory
1705 Corporate Drive Suite 400
Norcross, GA 30093

Re: K171861
Trade/Device Name: CAPILLARYS Hb A1c
Regulation Number: 21 CFR 862.1373
Regulation Name: Hemoglobin A1c test system
Regulatory Class: Class II
Product Code: PDJ
Dated: December 14, 2017
Received: December 20, 2017

Dear Karen Anderson:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part 801 and Part 809); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR

Part 820); and if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm for the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/) and CDRH Learn (http://www.fda.gov/Training/CDRHLearn). Additionally, you may contact the Division of Industry and Consumer Education (DICE) to ask a question about a specific regulatory topic. See the DICE website (http://www.fda.gov/DICE) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Kellie B. Kelm -S

for Courtney H. Lias, Ph.D.
Director
Division of Chemistry and Toxicology Devices
Office of In Vitro Diagnostics
and Radiological Health
Center for Devices and Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: 06/30/2020
See PRA Statement below.

510(k) Number *(if known)*
k171861

Device Name
CAPILLARYS Hb A1c

Indications for Use *(Describe)*
The CAPILLARYS Hb A1c kit is intended for separation and quantification of the HbA1c glycated fraction of hemoglobin (in IFCC unit (mmol/mol) and NGSP unit (%)) in venous whole human blood, by capillary electrophoresis in alkaline buffer with the CAPILLARYS 2 FLEX-PIERCING instrument. Measurement of hemoglobin A1c is used as an aid in diagnosis of diabetes, as an aid to identify patients who may be at risk for developing diabetes mellitus, and for the monitoring of long-term blood glucose control in individuals with diabetes mellitus. The CAPILLARYS Hb A1c kit is intended for in vitro Diagnostic Use Only.

Type of Use *(Select one or both, as applicable)*

☒ Prescription Use (Part 21 CFR 801 Subpart D) ☐ Over-The-Counter Use (21 CFR 801 Subpart C)

CONTINUE ON A SEPARATE PAGE IF NEEDED.

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k171861

510K SUMMARY (Summary of Safety and Effectiveness)

This summary of 510(k) safety and effectiveness information is being submitted in accordance with the requirements of 21 CFR 807.92.

Submitter Name	Sebia, Inc.
Address	1705 Corporate Drive Suite 400 Norcross, Georgia 30093, USA
Contact	Karen Anderson, Dir of Technical and QA Phone: 1-800-835-6497 Fax: 770-446-8511 Email: karen.anderson@sebia-usa.com
Date Prepared	February 6, 2018
Manufacturing	Sebia Parc Technologique Léonard de Vinci Rue Léonard de Vinci, CP 8010 LISSES, 91008 EVRY Cedex FRANCE Phone: (33) 1 69 89 80 80 Fax: (33) 1 69 89 78 78
Product Name	CAPILLARYS Hb A1c
Common Name	Whole blood hemoglobin A1c (HbA1c) by capillary electrophoresis
Product Regulation No.	21 CFR 862.1373
Product Codes	PDJ
Device classification and Panel Classification	Class II , Clinical Chemistry(75)
Establishment Registration No.	8023024

1. DEVICE DESCRIPTION

The CAPILLARYS 2 FLEX-PIERCING instrument uses the principle of capillary electrophoresis in free solution. With this technique, charged molecules are separated by their electrophoretic mobility in an alkaline buffer with a specific pH. Separation occurs according to the electrolyte pH and electroosmotic flow.

The CAPILLARYS 2 FLEX-PIERCING instrument has silica capillaries functioning in parallel allowing 8 simultaneous analyses of HbA1c quantification in a whole blood sample. A sample dilution with hemolysing solution is prepared and injected by aspiration at the anodic end of the capillary. A high voltage protein separation is then performed and direct detection of the hemoglobins is made at the cathodic end of the capillary at 415 nm, which is the absorbance wave length specific to hemoglobins. Before each run, the capillaries are washed with a wash solution and prepared for the next analysis with buffer.

Direct detection provides accurate relative quantification of individual hemoglobin A1c fraction. In addition, the high resolution of CAPILLLARYS Hb A1c procedure allows the quantification of HbA1c even in the presence of labile HbA1c, carbamylated and acetylated hemoglobins, and major hemoglobin variants.

By using an alkaline pH buffer, normal and abnormal (or variant) hemoglobins are detected in the following order, from cathode to anode: A2/C, E, S/D, F, A0, other Hb (including minor Hb A1) and then A1c.

The HbA1c concentrations are standardized and indicated in %HbA1c (DCCT/NGSP) and in mmol/mol (IFCC) units.

Reagents:

CAPILLARYS HbA1c KIT

ITEMS	PN 2015
Buffer (ready to use)	2 vials, 700 mL each
Hemolysing solution (ready to use)	1 vial, 700 mL
Wash solution (stock solution)	1 vial , 75 mL
Green dilution segments	1 pack of 90
Filters	4 filters

Additional reagents not included in the CAPILLARYS Hb A1c KIT

ITEMS	PN	COMPONENTS
CAPICLEAN	2058	1 vial, 25 mL

CAPILLARYS WASH SOLUTION	2052	2 vial, 75mL
TUBES AND CAPS FOR CONTROLS	9202 9205	20 units 500 units
Wedge adapters	9203	10 per box
PHORESIS software	1110	
CAPILLARYS 2 FLEX-PIERCING INSTRUMENT	1227	
Hb A1c CAPILLARY CALIBRATORS	4755 4756	1 SET 5 SETS
MULTI-SYSTEM Hb A1c CAPILLARY CONTROLS	4767 4768	10 SETS 1 SET

2. INDICATIONS FOR USE

CAPILLARYS Hb A1c kit:

The CAPILLARYS Hb A1c kit is intended for separation and quantification of the HbA1c glycated fraction of hemoglobin (in IFCC unit (mmol/mol) and NGSP unit (%)) in venous whole human blood, by capillary electrophoresis in alkaline buffer with the CAPILLARYS 2 FLEXPIERCING instrument. Measurement of hemoglobin A1c is used as an aid in diagnosis of diabetes, as an aid to identify patients who may be at risk for developing diabetes mellitus, and for the monitoring of long-term blood glucose control in individuals with diabetes mellitus. The CAPILLARYS Hb A1c kit is intended for in vitro Diagnostic Use Only

3. SUBSTANTIAL EQUIVALENCE INFORMATION:

Predicate Device Name	Predicate Device 510(k) number	Product Code	Regulation No.
Tosho Automated Glycohemoglobin Analyzer HLC-723G-8	k131580	PDJ	862.1373

Similarities between the candidate device (CAPILLARYS Hb A1c) and the predicate device (Tosoh HLC-723G8, k131580 (Table A).

Similarities		
Table A	**Sebia CAPILLARYS Hb A1c Candidate Device**	**Tosoh HLC-723G8 Predicate Device (k131580)**
Intended use	The CAPILLARYS Hb A1c kit is intended for separation and quantification of the HbA1c glycated fraction of hemoglobin (in IFCC unit (mmol/mol) and NGSP unit (%)) in venous whole human blood, by capillary electrophoresis in alkaline buffer with the CAPILLARYS 2 FLEX-PIERCING instrument. Measurement of hemoglobin A1c is used as an aid in diagnosis of diabetes, as an aid to identify patients who may be at risk for developing diabetes mellitus, and for the monitoring of long-term blood glucose control in individuals with diabetes mellitus. The CAPILLARYS Hb A1c kit is intended for in vitro Diagnostic Use Only	The Tosoh Automated Glycohemoglobin Analyzer HLC723G8 is intended for the in vitro diagnostic use for the measurement of % hemoglobin A1c (HbA1c) (DCCT/NGSP) and mmol/mol hemoglobin A1c (IFCC) in whole blood specimens. This test is to be used as an aid in diagnosis of diabetes and identifying patients who may be at risk of developing diabetes.
Specimen Type	Human Whole Blood	Human Whole Blood
Standardization	Traceable to the Diabetes Contraol and Complications Trial (DCCT) reference method and IFCC. Certified via the National Glycohemoglobin Standardization Program (NGSP)	Same
Linearity Measuring Range	4.4 – 16.6% (NGSP) 24 – 158 mmol/mol (IFCC)	4.0 – 16.9 %
Total Errorallowable bias 6%	Concentration TE% 5.1 5.9 6.4 4.1 8.2 2.8 12.2 3.1	Concentration TE% 5.0 5.8 6.5 2.8 8.0 3.0 12.0 3.1
Hemoglobin Variant Interferences	HbA2, HbS, HbC, HbD, does not interfere with this assay	HbA2, HbF, HbS, HbC, HbD, does not interfere with this assay

Table B. Differences between the predicate device (CAPILLARYS Hb A1c) and the candidate device (Tosoh HLC-723G8, k131580) in (Table B).

Differences		
Table B	**Sebia CAPILLARYS Hb A1c Candidate Device**	**Tosoh HLC-723G8 Predicate Device (k131580)**
Assay Principle	Capillary electrophoresis	Ion-exchange HPLC

Hemoglobin Variant Interferences	Hb E no interference	Hb E has known interference, a HbE flag is displayed and no Hb A1c is reported.

4. Performance Data:

a. Precision / Reproducibility:-

Precision

The precision of the CAPILLARYS Hb A1c procedure using the CAPILLARYS 2 FLEX-PIERCING was evaluated in a study based on the Clinical Laboratory Standards Institute (CLSI - USA) EP5A3 guideline "Evaluation of Precision of Quantitative Measurements Procedures; Approved Guideline – Third Edition".

The means, standard deviations (SD) and coefficients of variation (CV %) were calculated for HbA_{1c} concentration (mmol/mol) and percentage (%) for each sample.

Evaluation of Precision of Quantitative Measurement Procedures. Four whole blood samples at the following targeted HbA1c concentration of ~ 5%, ~ 6.5%, ~ 8%, and ~12% were used in the study

Eight (8) different samples were run using the CAPILLARYS Hb A1c procedure on the CAPILLARYS 2 FLEX-PIERCING instrument. The analyzed samples included 4 human blood samples (blood No. 1 to 4), 2 controls and 2 calibrators. Each sample was analyzed in duplicate on two capillaries per run, two runs per day over 20 days per lot of CAPILLARYS Hb A1c kit, using three lots yielding a total of 1440 results per sample over 60 days.

The reproducibility between instruments is summarized in the following tables including withincapillary, between-capillary, between-run, between-day, between-lot, between-instrument and total reproducibility precision estimates (SD and %CV) for the HbA_{1c} percentages.

Sample	Mean (mmol/mol)	Within-capillary		Between-capillary		Between-run		Between-day		Between-lot		Between-instrument		Total reproducibility (*)	
		SD	CV	SD	CV	SD	CV	SD	CV	SD	CV	SD	CV	SD	CV
Blood No. 1	32	0,60	1,9%	0,67	2,1%	0,00	0,0%	0,26	0,8%	0,35	1,1%	0,00	0,0%	0,99	3,1%
Blood No. 2	46	0,76	1,7%	0,40	0,9%	0,00	0,0%	0,27	0,6%	0,38	0,8%	0,00	0,0%	0,98	2,1%
Blood No. 3	66	0,78	1,2%	0,58	0,9%	0,00	0,0%	0,32	0,5%	0,36	0,6%	0,00	0,0%	1,09	1,6%
Blood No. 4	109	0,89	0,8%	0,88	0,8%	0,00	0,0%	0,51	0,5%	1,18	1,1%	0,00	0,0%	1,79	1,6%
Control 1	33	0,64	2,0%	0,57	1,8%	0,00	0,0%	0,36	1,1%	0,57	1,8%	0,03	0,1%	1,10	3,4%
Control 2	63	0,73	1,2%	0,99	1,6%	0,00	0,0%	0,79	1,2%	0,17	0,3%	0,91	1,4%	1,73	2,7%
Calibrator 1	37	0,76	2,0%	0,41	1,1%	0,00	0,0%	0,32	0,8%	0,44	1,2%	0,00	0,0%	1,02	2,7%
Calibrator 2	87	0,94	1,1%	0,67	0,8%	0,00	0,0%	0,23	0,3%	0,62	0,7%	0,00	0,0%	1,33	1,5%

(*) Total reproducibility includes : within-capillary, between-capillary, between-run, between-day, between-lot and between-instrument.

Sample	Mean (%)	Within-capillary		Between-capillary		Between-run		Between-day		Between-lot		Between-instrument		Total reproducibility (*)	
		SD	CV	SD	CV	SD	CV	SD	CV	SD	CV	SD	CV	SD	CV
Blood No. 1	5,1	0,06	1,1%	0,06	1,2%	0,00	0,0%	0,03	0,6%	0,03	0,5%	0,00	0,0%	0,09	1,8%
Blood No. 2	6,4	0,07	1,1%	0,04	0,6%	0,00	0,0%	0,03	0,4%	0,04	0,6%	0,00	0,0%	0,09	1,4%
Blood No. 3	8,2	0,07	0,9%	0,05	0,7%	0,00	0,0%	0,03	0,3%	0,03	0,4%	0,00	0,0%	0,10	1,2%
Blood No. 4	12,2	0,08	0,7%	0,08	0,6%	0,00	0,0%	0,04	0,4%	0,10	0,9%	0,00	0,0%	0,16	1,3%
Control 1	5,1	0,06	1,1%	0,05	1,1%	0,00	0,0%	0,03	0,7%	0,05	1,0%	0,01	0,3%	0,10	2,0%
Control 2	8,0	0,07	0,9%	0,09	1,1%	0,00	0,0%	0,07	0,9%	0,01	0,2%	0,08	1,1%	0,16	2,0%
Calibrator 1	5,6	0,07	1,3%	0,04	0,7%	0,00	0,0%	0,03	0,5%	0,05	0,9%	0,00	0,0%	0,10	1,8%
Calibrator 2	10,1	0,08	0,8%	0,06	0,6%	0,00	0,0%	0,02	0,2%	0,07	0,7%	0,00	0,0%	0,13	1,3%

(*) Total reproducibility includes : within-capillary, between-capillary, between-run, between-day, between-lot and between-instrument.

The reproducibility within the same instrument is summarized in the following tables :

- including within-capillary, between-capillary, between-run, between-day, between-lot and total reproducibility precision estimates (SD and %CV) for the HbA_{1c} concentrations (in mmol/mol) and percentages for each instrument.
- including the within-lot precision estimates (SD and %CV) for the HbA_{1c} concentrations (in mmol/mol) and percentages for each lot on each instrument.

Instrument No. 1

Sample	Mean (mmol/mol)	Within-capillary		Between-capillary		Between-run		Between-day		Between-lot		Total reproducibility (*)	
		SD	CV	SD	CV	SD	CV	SD	CV	SD	CV	SD	CV
Blood No. 1	32	0,60	1,9%	0,49	1,5%	0,00	0,0%	0,22	0,7%	0,42	1,3%	0,91	2,8%
Blood No. 2	46	0,80	1,7%	0,37	0,8%	0,00	0,0%	0,22	0,5%	0,38	0,8%	0,99	2,1%
Blood No. 3	66	0,77	1,2%	0,50	0,8%	0,00	0,0%	0,44	0,7%	0,36	0,6%	1,08	1,6%
Blood No. 4	109	0,90	0,8%	0,79	0,7%	0,00	0,0%	0,53	0,5%	1,11	1,0%	1,72	1,6%
Control 1	33	0,64	2,0%	0,49	1,5%	0,00	0,0%	0,40	1,2%	0,51	1,6%	1,04	3,2%
Control 2	63	0,75	1,2%	1,36	2,2%	0,00	0,0%	0,40	0,6%	0,29	0,5%	1,63	2,6%
Calibrator 1	37	0,80	2,1%	0,29	0,8%	0,00	0,0%	0,40	1,1%	0,32	0,8%	0,99	2,7%
Calibrator 2	87	0,91	1,1%	0,77	0,9%	0,00	0,0%	0,13	0,2%	0,65	0,7%	1,36	1,6%

(*) Total reproducibility includes : within-capillary, between-capillary, between-run, between-day and between-lot.

Sample	Mean (mmol/mol)	Within-lot (*)					
		Lot No. 1		Lot No. 2		Lot No. 3	
		SD	CV	SD	CV	SD	CV
Blood No. 1	32	0,88	2,7%	0,67	2,1%	0,87	2,7%
Blood No. 2	46	0,91	2,0%	0,96	2,1%	0,89	1,9%
Blood No. 3	66	0,87	1,3%	1,08	1,6%	1,10	1,7%
Blood No. 4	109	1,33	1,2%	1,36	1,2%	1,24	1,1%
Control 1	33	0,81	2,5%	0,99	3,1%	0,89	2,7%
Control 2	63	1,25	2,0%	1,59	2,5%	1,91	3,0%
Calibrator 1	37	0,87	2,3%	0,99	2,7%	1,02	2,7%
Calibrator 2	87	0,95	1,1%	1,40	1,6%	1,25	1,4%

(*) Within lot reproducibility includes : within-capillary, between-capillary, between-run and between-day.

Sample	Mean (%)	Within-capillary		Between-capillary		Between-run		Between-day		Between-lot		Total reproducibility (*)	
		SD	CV	SD	CV	SD	CV	SD	CV	SD	CV	SD	CV
Blood No. 1	5,1	0,06	1,3%	0,04	0,7%	0,00	0,0%	0,03	0,5%	0,03	0,7%	0,09	1,7%
Blood No. 2	6,4	0,07	1,1%	0,04	0,5%	0,00	0,0%	0,03	0,4%	0,03	0,5%	0,09	1,4%
Blood No. 3	8,2	0,08	0,9%	0,05	0,6%	0,00	0,0%	0,04	0,4%	0,04	0,5%	0,10	1,3%
Blood No. 4	12,2	0,08	0,7%	0,08	0,6%	0,00	0,0%	0,05	0,4%	0,10	0,8%	0,16	1,3%
Control 1	5,1	0,06	1,2%	0,04	0,7%	0,00	0,0%	0,04	0,7%	0,04	0,8%	0,09	1,8%
Control 2	8,0	0,07	0,9%	0,12	1,5%	0,00	0,0%	0,03	0,4%	0,02	0,3%	0,14	1,8%
Calibrator 1	5,6	0,07	1,2%	0,04	0,7%	0,00	0,0%	0,04	0,7%	0,04	0,7%	0,10	1,7%
Calibrator 2	10,1	0,09	0,9%	0,07	0,7%	0,00	0,0%	0,02	0,2%	0,07	0,7%	0,14	1,3%

(*) Total reproducibility includes : within-capillary, between-capillary, between-run, between-day and between-lot.

Sample	Mean (%)	Within-lot (*)

		Lot No. 1		Lot No. 2		Lot No. 3	
		SD	CV	SD	CV	SD	CV
Blood No. 1	5,1	0,07	1,5%	0,07	1,4%	0,09	1,8%
Blood No. 2	6,4	0,07	1,1%	0,08	1,3%	0,09	1,4%
Blood No. 3	8,2	0,08	1,0%	0,10	1,2%	0,10	1,2%
Blood No. 4	12,2	0,13	1,1%	0,12	1,0%	0,12	0,9%
Control 1	5,1	0,07	1,4%	0,09	1,7%	0,08	1,6%
Control 2	8,0	0,11	1,4%	0,13	1,6%	0,17	2,2%
Calibrator 1	5,6	0,07	1,3%	0,09	1,7%	0,10	1,7%
Calibrator 2	10,1	0,09	0,9%	0,14	1,3%	0,11	1,1%

(*) Within-lot reproducibility includes : within-capillary, between-capillary, between-run and between-day.

Instrument No. 2

Sample	Mean (mmol/mol)	Within-capillary		Between-capillary		Between-run		Between-day		Between-lot		Total reproducibility (*)	
		SD	CV	SD	CV	SD	CV	SD	CV	SD	CV	SD	CV
Blood No. 1	32	0,60	1,9%	0,25	0,8%	0,00	0,0%	0,23	0,7%	0,23	0,7%	0,73	2,3%
Blood No. 2	46	0,68	1,5%	0,36	0,8%	0,00	0,0%	0,35	0,8%	0,48	1,0%	0,97	2,1%
Blood No. 3	66	0,72	1,1%	0,32	0,5%	0,21	0,3%	0,26	0,4%	0,52	0,8%	1,00	1,5%
Blood No. 4	109	0,85	0,8%	0,72	0,7%	0,00	0,0%	0,44	0,4%	1,40	1,3%	1,84	1,7%
Control 1	33	0,62	1,9%	0,48	1,4%	0,00	0,0%	0,26	0,8%	0,63	1,9%	1,04	3,2%
Control 2	63	0,60	0,9%	0,92	1,4%	0,00	0,0%	0,63	1,0%	0,25	0,4%	1,30	2,0%
Calibrator 1	37	0,69	1,8%	0,31	0,8%	0,00	0,0%	0,28	0,7%	0,55	1,5%	0,97	2,6%
Calibrator 2	87	0,89	1,0%	0,46	0,5%	0,30	0,3%	0,32	0,4%	0,74	0,9%	1,32	1,5%

(*) Total reproducibility includes : within-capillary, between-capillary, between-run, between-day and between-lot.

Sample	Mean (mmol/mol)	Within-lot (*)					
		Lot No. 1		Lot No. 2		Lot No. 3	
		SD	CV	SD	CV	SD	CV
Blood No. 1	32	0,67	2,0%	0,63	2,0%	0,81	2,5%
Blood No. 2	46	0,83	1,8%	0,89	1,9%	0,85	1,8%
Blood No. 3	66	0,82	1,2%	0,85	1,3%	0,91	1,4%
Blood No. 4	109	1,08	1,0%	1,19	1,1%	1,30	1,2%
Control 1	33	0,88	2,6%	0,79	2,4%	0,81	2,4%
Control 2	63	1,39	2,2%	1,04	1,6%	1,36	2,1%
Calibrator 1	37	0,87	2,3%	0,77	2,1%	0,81	2,2%
Calibrator 2	87	0,92	1,1%	1,14	1,3%	1,18	1,4%

(*) Within lot reproducibility includes : within-capillary, between-capillary, between-run and between-day.

Sample	Mean (%)	Within-capillary		Between-capillary		Between-run		Between-day		Between-lot		Total reproducibility (*)	
		SD	CV	SD	CV	SD	CV	SD	CV	SD	CV	SD	CV
Blood No. 1	5,1	0,05	1,0%	0,02	0,4%	0,00	0,0%	0,02	0,5%	0,01	0,2%	0,06	1,2%
Blood No. 2	6,4	0,07	1,1%	0,04	0,6%	0,00	0,0%	0,03	0,4%	0,05	0,8%	0,10	1,5%
Blood No. 3	8,2	0,07	0,8%	0,02	0,3%	0,02	0,2%	0,03	0,3%	0,05	0,6%	0,09	1,1%
Blood No. 4	12,2	0,08	0,7%	0,06	0,5%	0,00	0,0%	0,03	0,3%	0,12	1,0%	0,16	1,3%
Control 1	5,1	0,05	1,1%	0,05	1,0%	0,00	0,0%	0,03	0,5%	0,06	1,1%	0,10	1,9%
Control 2	8,0	0,05	0,7%	0,09	1,1%	0,00	0,0%	0,06	0,7%	0,02	0,3%	0,12	1,5%
Calibrator 1	5,6	0,07	1,3%	0,03	0,6%	0,00	0,0%	0,02	0,4%	0,06	1,1%	0,10	1,8%
Calibrator 2	10,1	0,08	0,8%	0,05	0,5%	0,03	0,3%	0,02	0,2%	0,08	0,7%	0,12	1,2%

(*) Total reproducibility includes : within-capillary, between-capillary, between-run, between-day and between-lot.

Sample	Mean (%)	Within-lot (*)					
		Lot No. 1		Lot No. 2		Lot No. 3	
		SD	CV	SD	CV	SD	CV
Blood No. 1	5,1	0,05	1,1%	0,06	1,2%	0,07	1,3%
Blood No. 2	6,4	0,08	1,2%	0,08	1,3%	0,08	1,3%
Blood No. 3	8,2	0,07	0,9%	0,08	0,9%	0,08	1,0%
Blood No. 4	12,2	0,09	0,7%	0,11	0,9%	0,12	1,0%
Control 1	5,1	0,08	1,6%	0,09	1,7%	0,08	1,5%
Control 2	8,0	0,13	1,6%	0,10	1,3%	0,12	1,4%
Calibrator 1	5,6	0,08	1,4%	0,08	1,4%	0,09	1,6%
Calibrator 2	10,1	0,08	0,8%	0,11	1,1%	0,10	1,0%

(*) Within-lot reproducibility includes : within-capillary, between-capillary, between-run and between-day.

Instrument No. 3

Sample	Mean (mmol/mol)	Within-capillary		Between-capillary		Between-run		Between-day		Between-lot		Total reproducibility (*)	
		SD	CV	SD	CV	SD	CV	SD	CV	SD	CV	SD	CV
Blood No. 1	32	0,60	1,9%	1,01	3,2%	0,00	0,0%	0,31	1,0%	0,36	1,1%	1,27	3,9%
Blood No. 2	46	0,81	1,7%	0,45	1,0%	0,14	0,3%	0,21	0,5%	0,24	0,5%	0,99	2,1%
Blood No. 3	66	0,85	1,3%	0,82	1,2%	0,00	0,0%	0,22	0,3%	0,00	0,0%	1,20	1,8%
Blood No. 4	109	0,92	0,8%	1,08	1,0%	0,00	0,0%	0,54	0,5%	0,98	0,9%	1,81	1,7%
Control 1	33	0,66	2,1%	0,72	2,2%	0,00	0,0%	0,41	1,3%	0,56	1,7%	1,20	3,7%
Control 2	63	0,83	1,3%	0,49	0,8%	0,00	0,0%	1,13	1,8%	0,00	0,0%	1,49	2,4%
Calibrator 1	37	0,78	2,1%	0,57	1,5%	0,00	0,0%	0,25	0,7%	0,41	1,1%	1,08	2,9%
Calibrator 2	87	1,02	1,2%	0,73	0,8%	0,00	0,0%	0,19	0,2%	0,43	0,5%	1,34	1,5%

(*) Total reproducibility includes : within-capillary, between-capillary, between-run, between-day and between-lot.

Sample	Mean (mmol/mol)	Within-lot (*)					
		Lot No. 1		Lot No. 2		Lot No. 3	
		SD	CV	SD	CV	SD	CV
Blood No. 1	32	0,90	2,8%	1,24	3,9%	1,44	4,4%
Blood No. 2	46	0,76	1,6%	0,94	2,0%	1,16	2,5%
Blood No. 3	66	1,19	1,8%	1,12	1,7%	1,39	2,1%
Blood No. 4	109	1,45	1,3%	1,26	1,1%	1,80	1,7%
Control 1	33	0,92	2,8%	0,99	3,1%	1,25	3,8%
Control 2	63	1,50	2,4%	1,42	2,3%	1,53	2,4%
Calibrator 1	37	1,10	2,9%	0,91	2,5%	1,09	2,9%
Calibrator 2	87	1,18	1,4%	1,21	1,4%	1,42	1,6%

(*) Within lot reproducibility includes : within-capillary, between-capillary, between-run and between-day.

Sample	Mean (%)	Within-capillary		Between-capillary		Between-run		Between-day		Between-lot		Total reproducibility (*)	
		SD	CV	SD	CV	SD	CV	SD	CV	SD	CV	SD	CV
Blood No. 1	5,1	0,06	1,1%	0,10	1,9%	0,00	0,0%	0,04	0,7%	0,03	0,6%	0,12	2,4%
Blood No. 2	6,4	0,07	1,2%	0,04	0,6%	0,00	0,0%	0,02	0,3%	0,02	0,3%	0,09	1,4%
Blood No. 3	8,2	0,08	0,9%	0,08	0,9%	0,00	0,0%	0,02	0,2%	0,00	0,0%	0,11	1,3%
Blood No. 4	12,2	0,08	0,7%	0,09	0,8%	0,00	0,0%	0,05	0,4%	0,09	0,7%	0,16	1,3%
Control 1	5,1	0,06	1,2%	0,07	1,3%	0,00	0,0%	0,04	0,7%	0,05	1,0%	0,11	2,1%
Control 2	8,0	0,08	1,0%	0,05	0,6%	0,00	0,0%	0,10	1,3%	0,00	0,0%	0,13	1,7%
Calibrator 1	5,6	0,08	1,4%	0,05	0,9%	0,00	0,0%	0,03	0,5%	0,05	0,9%	0,11	1,9%
Calibrator 2	10,1	0,09	0,9%	0,07	0,7%	0,00	0,0%	0,02	0,2%	0,05	0,5%	0,13	1,2%

(*) Total reproducibility includes : within-capillary, between-capillary, between-run, between-day and between-lot.

Sample	Mean (%)	Within-lot (*)					
		Lot No. 1		Lot No. 2		Lot No. 3	
		SD	CV	SD	CV	SD	CV
Blood No. 1	5,1	0,09	1,8%	0,12	2,3%	0,14	2,7%
Blood No. 2	6,4	0,07	1,1%	0,09	1,4%	0,10	1,6%
Blood No. 3	8,2	0,10	1,3%	0,10	1,2%	0,13	1,6%
Blood No. 4	12,2	0,12	1,0%	0,11	0,9%	0,16	1,3%
Control 1	5,1	0,09	1,7%	0,09	1,8%	0,11	2,2%
Control 2	8,0	0,13	1,7%	0,12	1,6%	0,14	1,8%
Calibrator 1	5,6	0,10	1,8%	0,09	1,6%	0,11	2,0%
Calibrator 2	10,1	0,11	1,1%	0,12	1,1%	0,12	1,2%

(*) Within-lot reproducibility includes : within-capillary, between-capillary, between-run and between-day.

b. Linearity / assay reportable range

A linearity study was performed per CLSI EP06-A: Evaluation of Quantitative Measuring Procedures; A Statistical Approach. Linearity across the reportable range was performed using low 4.4% Hb A1c (24 mmol/mol) and high 16.7% (159 mmol/mol).

Mixture of 2 different blood samples:
This linearity study of the CAPILLARYS Hb A1c procedure was evaluated in a study based on the Clinical Laboratory Standards Institute (CLSI - USA) EP6-A guideline "Evaluation of the Linearity of Quantitative Measurement Procedures: A statistical Approach; Approved Guideline".
The results for HbA_{1c} concentration (mmol/mol) and percentage (%) were analyzed using statistical tools recommended by CLSI.

2 characteristic blood samples, including a normal sample and an elevated HbA_{1c} level sample were mixed within different proportions and the mixtures were electrophoresed with the CAPILLARYS Hb A1c procedure. For each mixture, samples were analyzed in triplicate. The tests were determined to be linear within the entire range studied for HbA_{1c} hemoglobin fraction. The stated measuring range is 24 mmol/mol to 158 mmol/mol HbA_{1c} (4.4 % to 16.6 % HbA_{1c}).

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

The CAPILLARYS Hb A1c test standardization is traceable to the International Federation of Clinical Chemistry (IFCC) reference calibrators.

The CAPILLARYS Hb A1c assay is NGSP certified. The NGSP certification expires in one year. See the NGSP website for current certification at http://www.ngsp.org

Hb A1c results are provided in two different units: NGSP equivalent units (%) and IFCC equivalent units (mmol/mol).

d. Calibrators and Controls

The Hb A1c CAPILLARY CALIBRATORS are required for use with this device. Value assignment and stability protocol and acceptance criteria were previously reviewed and cleared in k122101.
Sebia MULTI-SYSTEM Hb A1c CAPILLARYS CONTROLS are required for use with this device and cleared in submission k162281.

e. Comparison Studies

A method comparison study of 150 variant-free whole blood samples covering the measuring range were evaluated using the CAPILLARYS Hb A1c kit and the CAPILLARYS 2 FLEXPIERCING instrument. The results were compared to the testing performed at a NGSP reference laboratory using the cleared HPLC HbA1c method (Automated Glycohemoglobin Analyzer HLC-712G8).

To support the diagnostic claim for HbA1c the samples spanned around the decision points as follows:

Samples distribution

HbA1c level	Number of samples	% of samples
HbA1c ≤ 5,0 %	7	5
5,0 % < HbA1c ≤ 6,0 %	19	13
6,0 % < HbA1c ≤ 6,5 %	35	23
6,5 % < HbA1c ≤ 7,0 %	36	24
7,0 % < HbA1c ≤ 8,0 %	23	15
8,0 %< HbA1c ≤ 9,0 %	13	9
HbA1c > 9,0 %	17	11
Total	150	100

HbA1c results given as a NGSP unit (%)

Fraction	Regression Analysis	Correlation coefficient	y-intercept	Slope	Range of HbA1c % values CAPILLARYS Hb A1c
HbA1c	Ordinary linear fit	0,999	-0,265	1,027	4,4 - 16,6

150 samples

HbA1c results given as a NGSP unit (%)

	Regression Analysis (HbA1c fraction)		
	Ordinary linear fit	Weighed Deming	Passing-Bablok
	95 % Confidence Intervals are shown in parentheses		
Points (Plotted/Total)	150/150		
Results Ranges	4,4 to 16,6		
Normal range	< 6,5		
Correlation coefficient (r)	0,999		
Slope	1,027 *(1,019 to 1,035)*	1,023 *(1,012 to 1,034)*	1,000 *(1,000 to 1,026)*
y-intercept	-0,265 *(-0,325 to -0,204)*	-0,235 *(-0,312 to -0,158)*	-0,100 *(-0,248 to -0,039)*
Average bias (all samples)	-0,07 *(-0,08 to -0,05)*		
Bias at normal range (6,5 %)	-0,09 (-0,11 to -0,07)	-0,09 (-0,10 to -0,07)	-0,10 (-0,10 to -0,04)

The unit of the bias is the same of the result provided (%)

f. Total Error Calculations

Total error (TE) is calculated for 4 concentrations, corresponding to the concentrations of the samples used in the reproducibility study, (5.1 %, 6.4 %, 8.2 % and 12.2 %) using the results of bias estimation (%Bias) and coefficients of variation (CV).
Total Error is calculated as follows: Total Error is calculated as follows: %TE= (%Bias)+ 1.96 × %CV×(1+%Bias/100)

The results are presented in the following table for the CAPILLARYS Hb A1c using the CAPILLARYS 2 FLEX-PIERCING instrument:

HbA1c results given as a NGSP unit (%)

Linear equation regression	Target (%)	y from linear equation	Deviation from target	%Bias	CV (%)	TE (%)	Specification
y = 1,027 x -0,265	5,1	5,0	-0,1	-2,47	1,8	5,9	≤ 6,0%
	6,4	6,3	-0,1	-1,42	1,4	4,1	
	8,2	8,2	0,0	-0,51	1,2	2,8	
	12,2	12,3	0,1	0,55	1,3	3,1	

Total Error is calculated as follows: %TE= |%Bias|+ 1.96 x %CV×(1+%Bias/100)

g. Interferences

Interference studies were performed per CLSI EP07-A2, Interference Testing in Clinical Chemistry. Each study was performed using 2 different whole blood samples: a blood sample close to the cut-off value and a blood sample with elevated HbA1c level. Ten replicates were analyzed using the CAPILLARYS Hb A1c on the CAPILLARYS 2 FLEX-PIERCING testing system.

No interference with the CAPILLARYS Hb A1c procedure was detected due to the blood sample's high concentration of the following interfering factors tested at levels equal to the concentrations listed below:

Endogenous interfering factor	Concentration
Conjugated bilirubin	60 mg/dL
Unconjugated bilirubin	60 mg/dL
D-glucose	1000 mg/dL (55 mM)
Rheumatoid factor	1076 IU/mL
Total Protein	149,5 g/L
Triglycerides	2,89 g/dL (33,1 mM)
Urea	265 mg/dL (44,2 mM)

Drug	Concentration
Acetaminophen	200 mg/L (1325 µM)
Acetylcysteine	200 mg/dL (12,3 mM)
Acetylsalicilyc acid	1000 mg/dL (55,56 mM)
Ampicillin-Na	1000 mg/dL (28653 µM)
Ascorbic acid	300 mg/dL (17045 µM)
Cefoxitin	2500 mg/dL (58548 µM)
Cyclosporine	5 mg/L
Doxycycline	50 mg/dL (1123,6 µM)
Glybenclamide	3 mg/dL
Heparin	5000 U/L
Ibuprofen	500 mg/L (2427 µM)
Levodopa	40 mg/dL
Metformin	5 mg/dL (387 µM)
Methyldopa	40 mg/dL (1896 µM)
Metronidazole	200 mg/dL (11696 µM)
Phenylbutazone	400 mg/L
Rifampicin	70 mg/L (85,1 µM)
Theophylline	100 mg/L (556 µM)

Hemoglobin Derivatives and cross reactants	Concentrations
Carbamylated Hemoglobin	≤ 8.1 mg/mL
HbA1a+b	≤ 0.20 mg/mL
Labile HbA_{1c}	≤ 19.7 mg/mL
Acetylated hemoglobin	≤ 4.2 mg/mL

Glycated Albumin	≤ 2.2 mg/mL

Hemoglobin Variant Study was performed using specific samples known to contain hemoglobin variants S, C, E, D, A2 and F. The samples were analyzed with a reference method performed in a NGSP laboratory (reference) and with CAPILLARYS Hb A1c procedure on CAPILLARYS 2 FLEX-PIERCING instrument (test): percentages of HbA1c fraction. The relative deviation (%) between the reference procedure and the test procedure has been calculated for each sample (see the following tables).

Hemoglobin Variants	No.of Samples	Ranges in % Variant	Range of % HbA1c Concentration
Hb A2	20	4.0-7.7	4.5-11.0
Hb F	20	1.5-31.4	4.9-15.1
Hb S	20	33.0-40.8	4.9-14.0
Hb C	20	28.0-37.2	4.6-13.1
Hb D	21	35.5-41.3	5.2-11.8
Hb E	22	21.3-37.0	4.8-9.8

Hemoglobin fraction	Mean relative % Bias (Range of relative % Bias)	
	~ 6,5 % Hb A1c	~ 9,0 % Hb A1c
Hb S	0,8 (0,0 to 1,6)	0,4 (-3,1 to 3,2)
Hb C	0,0 (0,0 to 0,0)	3,3 (1,0 to 5,7)
Hb D	0,5 (-1,4 to 1,6)	-1,9 (-2,4 to -1,2)
Hb E	-0,4 (-3,3 to 1,5)	-0,3 (-3,7 to 2,1)
Hb A2	-3,4 (-4,5 to -1,4)	-0,8 (-2,0 to 0,0)
Hb F	-3,3 (-4,8 to -1,6)	-2,0 (-5,0 to 0,0)

- Levels of Hb F up to 23 % in the blood sample do not interfere with HbA1c fraction quantification, a result is reported by the software when the Hb F level is higher than 23 % along with a warning message “Atypical profile – Possible quantitative interference if Hb F or variant > 23 %”. It is recommended to analyze the sample with CAPILLARYS HEMOGLOBIN(E) procedure to verity the Hb F percentage and to study the patient’s clinical data.

- Levels of Hb A2 up to 7.7 % in the blood sample do not interfere with HbA1c fraction quantification.

- No interference has been observed with HbA1c fraction quantification due to the presence of major abnormal hemoglobins Hb S (≤ 40.8 %), Hb C (≤ 37.2 %), Hb D (≤ 41.3 %) and Hb E (≤ 37.0 %).

h. Expected Values/ Reference Range

Hemoglobin A1c expected value range was cited from the American Diabetes Association (Standards of Medical Care in Diabetes 2016, 39 (Suppl 1)
The American Diabetes Association's (ADA) most recent Clinical Practice are:

Category	HbA_{1c} Range (IFCC)	HbA_{1c} Range (NGSP/DCCT)
Normal	< 39 mmol/mol	< 5.7 %
Prediabetes (increased risk for diabetes)	39 mmol/mol - 47 mmol/mol	5.7 % - 6.4 %
Diabetes	≥ 48 mmol/mol	≥ 6.5 %

The expected HbA1c range for non-diabetic adults is 20 – 42 mmol/mol or 4.0 – 6.0 %. However, each laboratory should establish its reference range and HbA1c goal following state and federal regulations and taking into account sex, age, ethnicity and individual patient situation.

5. Requirements for Diabetes Diagnosis Claim

YES OR NO	Requirement
YES	Device must have initial and annual standarization verification by certifying glycohemoglobin standardization organization deemed acceptable by FDA
YES	Performance testing of device precision must, at a minimum use blood samples with concentrations near 5.0%, 6.5%, 8.0% and 12 % hemoglobin A1c. Testing must evaluate precision over a minimum of 20 days using at least 3 lots of the device and instruments, as applicable
YES	Performance testing of accuracy must include a minimum of 120 blood samples that span the measuring interval of the new device and compare results of the new device to results of the standardized method. Results must demonstrate little or no bias versus the standardized method.
YES	Total error of the new device must be evaluated using single measurments by the new device compared to the results of the standardized test method, and this evaluation must demonstrate a total error of less than or equal to 6%
YES	Performance testing must demonstrate that there is little to no interference from common hemoglobin variants, including Hemoglobin C, Hemoglobin D, Hemoglobin E, Hemoglobin A2 and Hemoglobin S.
NA	When assay interference from Hemoglobin F or interference with other hemoglobin variants with low frequency in the population is observed, a warning statement must be placed in a black box and must appear in all the labeling material for these deivces describing the interference and any affected population.

6. Conclusion:

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