510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
DEVICE ONLY TEMPLATE

A. 510(k) Number:
K030553

B. Analyte:
Glycosylated hemoglobin (HbA1C)

C. Type of Test:
Quantitative

D. Applicant:
ARKRAY Inc.

E. Proprietary and Established Names:
ARKIT HbA1C

F. Regulatory Information:
1. Regulation section:
   21 CFR 864.7470, Assay, glycosylated hemoglobin; 862.1150, Calibrator, Secondary; 862.1660, Single (specified) analyte controls (assayed and unassayed)
2. Classification:
   Class II, Class I
3. Product Code:
   LCP, JIT, JJX
4. Panel:
   81, 75

G. Intended Use:

1. Indication(s) for use:
   ARKIT HbA1C is a laboratory test intended for the quantitative determination of HbA1C % in blood by an enzymatic method to monitor long-term blood glucose control in individuals with diabetes mellitus. It is for *in vitro* diagnostic use. The ARKIT HbA1C Calibrator and ARKIT HbA1C Control are designed to be used with the ARKIT HbA1C test for the determination of HbA1C in blood.
2. Special condition for use statement(s):
   NA
3. Special instrument Requirements:
   Bayer ADVIA 1650 Analyzer

H. Device Description:
The in vitro diagnostic reagent kit contains the following: 2 bottles of 200 mL each of Reagent 1 (Hemolysis Reagent), 1 bottle of 100 mL of Reagent 2 (Proteolytic Hemoglobin and Hemoglobin Measuring Reagent), 1 bottle of 25 mL of Reagent 3 (Colorimetric Reagent), and 1 bottle of Reagent 4 (Hb Reagent). ARKIT HbA1C Calibrator contains 5 vials (1 mL each) of low calibrator and 5 vials (1 mL each) of high calibrator. ARKIT HbA1C Control contains 5 vials (1 mL each) of low control

and 5 vials (1 mL each) of high control. The calibrator and control material are sold separately. Red blood cells or whole blood may be used for the test. Heparin, EDTA, or fluoride may be used as anticoagulants.

I. Substantial Equivalence Information:
1. Predicate device name(s):
   Roche Diagnostics Unimate 3/ Unimate 5 HbA1C
2. Predicate K number(s):
   K952337
3. Comparison with predicate:

Similarities		
Item	**ARKIT HbA1C**	**Roche Unimate HbA1C**
Intended Use	Intended for the quantitative determination of HbA1C % in blood by an enzymatic method to monitor long-term blood glucose control in individuals with diabetes mellitus.	Intended for the quantitative determination of HbA1C % in blood by an enzymatic method to monitor long-term blood glucose control in individuals with diabetes mellitus.
Specificity	Acetylated Hb, carbamylated Hb, and labile HbA1C do not affect the assay result	Acetylated Hb, carbamylated Hb, and labile HbA1C do not affect the assay result
Sample type	Hemolysate	Hemolysate
Differences		
Item	**ARKIT HbA1C**	**Roche Unimate HbA1C**
Measurement principle	Enzymatic	Turbidimetric immunoassay
Measuring range	2-16 %	2-25 %

J. Standard/Guidance Document Referenced (if applicable):
NCCLS EP 5-A, NGSP (National Glycohemoglobin Standardization Program), IFCC HbA1C calibrators.

K. Test Principle:
Hemoglobin and hemoglobin A1C are determined separately using ARKIT HbA1C and final hemoglobin A1C % is calculated from the ratio of concentration between hemoglobin A1C and hemoglobin. The measurement principle of hemoglobin concentration is the alkaline hematin method, a general measurement using Hb reagent, or the oxyhemoglobin method, a general method using Reagent 2. Either Hb reagent or Reagent 2 may be used for the hemoglobin measurement, depending on the performance requirements of the analyzer. Hemoglobin A1C in hemolysate sample is digested proteolitically for glycated hemoglobin sites by specific protease. The product is measured by fructosyl amino acid oxidase, peroxidase, and coupler.

L. Performance Characteristics (if/when applicable):
1. Analytical performance:

a. *Precision/Reproducibility:*
The inter-assay precision was evaluated by assaying two samples 20 times each in one batch. The inter-assay precision, as measured as % CV, was 1.1 % for sample mean 5.0 and 0.7 % for sample mean 8.7 using Hb reagent and 0.6 % for sample mean 5.0 and 0.5 % for sample mean 8.6 using Reagent 2. Intra-assay precision was performed following NCCLS EP-5-A guidelines. The intra-assay precision was evaluated by assaying replicates of two samples for 20 days. The intra-assay precision, as measured by % CV, was 1.6% for sample mean 5.0 and 1.4 % for sample mean 8.6 using Hb reagent and 1.6 % for sample mean 5.0 and 1.3 % for sample mean 8.6 using Reagent 2.

b. *Linearity/assay reportable range:*
Linearity was determined by assaying serial measurements of dilutions of 2 samples, the high range sample having an HbA1C of 19.9 % and the lower range sample having an HbA1C level of 1.7 %. Linearity of the assay is 2 to 16 %.

c. *Traceability (controls, calibrators, or method):*
The IFCC values of ARKIT HbA1C Calibrator and Control were assigned from IFCC HbA1C calibrators. The NGSP values were then assigned by the relationship between IFCC and NGSP (NGSP = 0.92 IFCC + 2.05). The ARKIT HbA1C test has not been tested or certified by the NGSP.

d. *Detection limit:*
The detection limit is defined as the lowest measurable value distinguishable from zero. The sensitivity was determined by assaying diluted samples of a normal specimen diluted with the blank 10 times in the same assay. The detection limit is 1.17 g/L of hemoglobin using Hb reagent, 1.21 g/L of hemoglobin using Reagent 2, and 0.107 g/L of hemoglobin A1C on the Bayer ADVIA 1650 analyzer.

e. *Analytical specificity:*
The influence of carbamylated hemoglobin was studied by spiking specimens with sodium cyanate ranging from 0 to 1000 mg/L. The influence of acetylated hemoglobin was studied by spiking specimens with acetylsalicylic acid ranging from 0 to 500 mg/L. The influence of acetaldehydelated hemoglobin was studied by spiking specimens with acetaldehyde ranging from 1 to 1000 mg/L. The influence of labile hemoglobin A1C was studied by spiking specimens with glucose ranging from 0 to 15000 mg/L. Final measurement of HbA1C was not influenced by carbamylated, acetylated or acetyaldehydelated hemoglobin or labile hemoglobin A1C. The final HbA1C is independent of bilirubin concentration less than 40 mg/L, vitamin C less than 200 mg/L, albumin less than 200 mg/L, and lipemia less than 2000 mg/dL.

    f. *Assay cut-off:*
    NA

2. Comparison studies:
    a. *Method comparison with predicate device:*
    A study analyzing 98 patient specimens ranging in concentration from 4.9 to 13.2 % HbA1C, with this device (Y) and the predicate device (X) was performed. A linear regression equations of $Y = 1.164X - 1.517$, $r = 0.977$ using Hb Reagent and $Y = 1.161X - 1.495$, $r = 0.975$ using Reagent 2. Red blood cells anticoagulated with EDTA were used for the studies.

    b. *Matrix comparison:*
    Low and high samples were prepared to which heparin disodium was added to a concentration of 550 mg/L, dipotassium EDTA was added to a concentration of 5000 mg/L, and sodium fluoride was added to a concentration of 10 mg/L. The final measurement of HbA1C was not influenced by these anticoagulants.

3. Clinical studies:
    a. *Clinical sensitivity:*
    NA
    b. *Clinical specificity:*
    NA
    c. *Other clinical supportive data (when a and b are not applicable):*
    NA

4. Clinical cut-off:
    NA

5. Expected values/Reference range:
The reference range was determined by evaluating samples from 275 healthy individuals. The range was determined as the mean ± 1.96 SD, resulting in the determination of the 95 % confidence interval for the reference range. The mean is 5.3 % HbA1C and the reference range is 4.8 - 5.7 %.

M. Conclusion:
Based upon a review of the information presented in this PMN, I recommend that this device is substantially equivalent to devices regulated by 21 CFR 864.7470, Assay, glycosylated hemoglobin; 862.1150, Calibrator, Secondary; 862.1660, Single (specified) analyte controls (assayed and unassayed).