October 23, 2018

Randox Laboratories Ltd.
Pauline Armstrong
Senior QA/Regulatory Affairs Manager
55 Diamond Road
Crumlin, Co. Antrim, BT29 4QY
GB

Re: K182042
Trade/Device Name: Randox Calcium (Ca)
Regulation Number: 21 CFR 862.1145
Regulation Name: Calcium test system
Regulatory Class: Class II
Product Code: CJY
Dated: July 27, 2018
Received: July 30, 2018

Dear Pauline Armstrong:

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. Although this letter refers to your product as a device, please be aware that some cleared products may instead be combination products. The 510(k) Premarket Notification Database located at https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm identifies combination product submissions. 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) for devices or postmarketing safety reporting (21 CFR 4, Subpart B) for combination products (see https://www.fda.gov/CombinationProducts/GuidanceRegulatoryInformation/ucm597488.htm); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820) for devices or current good manufacturing practices (21 CFR 4, Subpart A) for combination products; 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 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)*

K182042

Device Name

RANDOX CALCIUM (Ca)

Indications for Use *(Describe)*

The Randox Calcium (Ca) device is intended for the quantitative in vitro determination of calcium concentration in serum, plasma and urine. This product is suitable for use on the RX series analyzer, RX daytona plus. Such measurements are used in the diagnosis and treatment of parathyroid disease, a variety of bone diseases and chronic renal failure.

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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## 1. SAFETY AND EFFECTIVENESS AS REQUIRED BY 21 CFR 807.92 STATEMENT

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

## 2. SUBMITTER NAME AND ADDRESS

**Name:** Dr Pauline Armstrong

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County Antrim, BT29 4QY,
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**Date of Summary Preparation:** 16 October 2018

## 3. 510k NUMBER, DEVICE PROPRIETARY NAME, COMMON NAME, PURPOSE FOR SUBMISSION, REGULATORY CLASSIFCATION, PANEL, PRODUCT CODE AND 21 CFR NUMBER

**510k No:** k182042

**Device Proprietary Name:** RANDOX CALCIUM (Ca)

**Common Name:** RANDOX CALCIUM (Ca)

**Purpose for Submission:** New Device

| Product Code | Regulation Name | Classification | Regulation Section | Panel |
|---|---|---|---|---|
| CJY | Calcium test system | II | 21 CFR 862.1145 | Clinical Chemistry 75 |

## 4. PREDICATE DEVICE PROPRIETARY NAMES AND 510 (k) NUMBERS

**Predicate Device Proprietary Name:**
ADVIA Chemistry Calcium_2 (CA_2) Method, 510(k) Number: K083386

## 5. INTENDED USE

The Randox Calcium (Ca) device is intended for the quantitative *in vitro* determination of calcium concentration in serum, plasma and urine. This product is suitable for use on the RX series analyzer RX daytona plus. Such measurements are used in the diagnosis and treatment of parathyroid disease, a variety of bone diseases and chronic renal failure.

## 6. DEVICE DESCRIPTION

The Randox Calcium (Ca) kit consists of a ready to use reagent solution.

**CATALOGUE NUMBER:** CA8309

R1. Arsenazo III Reagent 4 x 20 ml

**REAGENT COMPOSITION**

| Contents | Initial Concentration of Solutions |
|---|---|
| **R1. Arsenazo III Reagent** | |
| Sodium Acetate | 54.2 mmol/l, pH 5.9 |
| Arsenazo | approx.. 230µmol/l |
| Non-Reactive Stabilisers | |

## 7. PREDICATE DEVICE COMPARISON TABLE

**Table 1 Comparison of the Randox Calcium (Ca), with the Advia Chemistry Calcium_2 (CA_2) Method**

| CHARACTERISTICS | **ADVIA Chemistry** Calcium_**2 (CA_2) Method**<br><br>**510(k) k083386** | **Randox Calcium (Ca)**<br><br>**510(k) k182042** |
|---|---|---|
| **INTENDED USE** | A calcium test system intended for the quantitative *in vitro* determination of calcium concentration in serum, plasma and urine on the ADVIA Chemistry systems, | A calcium test system intended for the quantitative *in vitro* determination of calcium concentration in serum, plasma and urine on the RX series analyser RX daytona plus. |
| **ASSAY PROTOCOL** | Arsenazo III | Arsenazo III |
| **STORAGE (UNOPENED)** | Reagents stable to expiry when stored at +15 to +25 $^{o}$ C | Reagents stable to expiry when stored at +15 to +25 $^{o}$ C |
| **SAMPLE TYPE** | Human serum, plasma & urine | Same |
| **REAGENT COMPOSITION** | Sodium acetate (pH 5.9) 54.4 mmol/l<br>Arsenazo III 188µmol/l<br>Non-reactive stabilizers | Sodium acetate (pH 5.9) 54.4 mmol/l<br>Arsenazo approx. 230µmol/l<br>Non-reactive stabilizers |
| **FORMAT** | Liquid ready to use | Liquid ready to use |
| **MEASURING RANGE** | Serum/Plasma 1.0 mg/dL - 16 mg/dL<br>Urine 1.0 mg/dL - 32 mg/dL | Serum/Plasma 1.0 mg/dL - 16 mg/dL<br>Urine 1.0 mg/dL - 32 mg/dL |
| **DEVICE CLASSIFICATION** | Calcium test system | Calcium test system |

The Randox Calcium (Ca) device has the same intended use as the predicate device. Any differences in the technical characteristics between the candidate and predicate device do not affect the safety or effectiveness. Therefore, the Randox Calcium (Ca) device demonstrates substantial equivalence to the predicate device.

## 8. TEST PRINCIPLE

Arsenazo III specifically binds to Calcium ions to form a coloured complex at 660nm.

$$Ca^{2+} + \text{Arsenazo III} \xrightarrow{\text{pH 5.9}} \text{Ca-Arsenazo III Complex (purple)}$$

The amount of calcium present in the sample is directly proportional to the intensity of the coloured complex formed.

## 9. PERFORMANCE CHARACTERISTICS

Analytical performance:

*a. Precision/Reproducibility:*

Precision was evaluated consistent with C.L.S.I documents EP05-A3 'Evaluation of Precision of Quantitative Measurement Procedures: Approved Guideline – Third Edition.
Precision studies were performed on one RX daytona plus system using two levels of controls, calibration material and human serum samples for Calcium.
Urine precision studies were performed for Calcium using two levels of urine controls, calibration material and human urine samples for Calcium.
Testing was conducted twice per day for 20 non consecutive days. Two replicates per run were performed for each sample.

The results are summarized in the tables below:

### Calcium Serum Precision Summary

Lot 1

| System: RX daytona plus | | | Within Run | | Total | |
|---|---|---|---|---|---|---|
| **Method** | **Product** | **Mean** (mg/dL) | **SD** | **CV %** | **SD** | **CV %** |
| Ca | Serum Level 1 | 3.89 | 0.12 | 3.1 | 0.16 | 4.1 |
| Ca | Serum Level 2 | 6.61 | 0.16 | 2.4 | 0.24 | 3.6 |
| Ca | Serum Level 3 | 10.78 | 0.28 | 2.6 | 0.40 | 3.7 |
| Ca | Serum Level 4 | 13.95 | 0.32 | 2.3 | 0.52 | 3.7 |

Lot 2

| System: RX daytona plus | | | Within Run | | Total | |
|---|---|---|---|---|---|---|
| **Method** | **Product** | **Mean** (mg/dL) | **SD** | **CV %** | **SD** | **CV %** |
| Ca | Serum Level 1 | 3.85 | 0.08 | 2.1 | 0.16 | 4.2 |
| Ca | Serum Level 2 | 6.65 | 0.16 | 2.4 | 0.28 | 4.2 |
| Ca | Serum Level 3 | 10.70 | 0.24 | 2.2 | 0.44 | 4.1 |
| Ca | Serum Level 4 | 13.83 | 0.32 | 2.3 | 0.56 | 4.0 |

### Calcium Urine Precision Summary

Lot 1

| System: RX daytona plus | | | Within Run | | Total | |
|---|---|---|---|---|---|---|
| **Method** | **Product** | **Mean** (mg/dL) | **SD** | **CV %** | **SD** | **CV %** |
| Ca | Urine Level 1 | 6.05 | 0.16 | 2.6 | 0.28 | 4.6 |
| Ca | Urine Level 2 | 7.94 | 0.16 | 2.0 | 0.32 | 4.0 |
| Ca | Urine Level 3 | 15.07 | 0.40 | 2.7 | 0.60 | 4.0 |
| Ca | Urine Level 4 | 25.97 | 0.56 | 2.2 | 1.00 | 3.9 |

Lot 2

| System: RX daytona plus | | | Within Run | | Total | |
|---|---|---|---|---|---|---|
| **Method** | **Product** | **Mean** (mg/dL) | **SD** | **CV %** | **SD** | **CV %** |
| Ca | Urine Level 1 | 6.05 | 0.16 | 2.6 | 0.24 | 4.0 |
| Ca | Urine Level 2 | 7.90 | 0.20 | 2.5 | 0.32 | 4.1 |
| Ca | Urine Level 3 | 15.11 | 0.36 | 2.4 | 0.60 | 4.0 |
| Ca | Urine Level 4 | 26.05 | 0.52 | 2.0 | 0.96 | 3.7 |

*b. Linearity/assay reportable range:*

Linearity studies have been carried out in accordance with C.L.S.I. standard EP6-A. Linearity studies were performed at 11 levels to determine the analytical range of an assay - that is the range where the reported result is a linear function to the analyte concentration (or where deviation from linearity is less than 5%).

The linearity samples were prepared at 11 levels including levels below and above the claimed measuring range.

The results are summarized as follows:

Serum Linearity Summary for Calcium

| Lot | Linear Regression | Correlation Coefficient r | Reportable Range |
|---|---|---|---|
| Lot 1 | y = 1.01x – 0.04 | 1.00 | 1.0 - 16 mg/dL |
| Lot 2 | y = 1.02x + 0.04 | 1.00 | 1.0 - 16 mg/dL |

The reportable range of the assay for serum and plasma samples is 1.0 – 16 mg/dL.

Urine Linearity Summary for Calcium

| Lot | Linear Regression | Correlation Coefficient r | Reportable Range |
|---|---|---|---|
| Lot 1 | y = 0.99x + 0.20 | 1.00 | 1.0 – 32 mg/dL |
| Lot 2 | y = 0.98x + 0.28 | 1.00 | 1.0 – 32 mg/dL |

The reportable range of the assay for urine samples is 1.0 - 32 mg/dL.

*c. Analytical Specificity:*

The effects of potential interferents were determined by calculating the mean value of the spiked interferent with the corresponding control solution. The spiked sample results were compared to control samples prepared without the potential interferents. Sponsor's Acceptance Criteria: a deviation of $\leq \pm$ 10% for the test sample as compared to the control sample.

Serum Summary

The following analytes were tested up to the levels indicated at Calcium concentrations of 8 mg/dL and 12 mg/dL and found not to interfere.

**Interferents in serum samples**

| | Calcium Concentration | |
|---|---|---|
| **Interferent** | **8 mg/dL** | **12 mg/dL** |
| Haemoglobin | 1000 mg/dL | 1000 mg/dL |
| Total Bilirubin | 60 mg/dL | 60 mg/dL |
| Conjugated Bilirubin | 60 mg/dL | 60 mg/dL |
| Triglycerides | 2000 mg/dL | 2000 mg/dL |
| Intralipid | 1315 mg/dL | 2000 mg/dL |
| Ascorbic Acid | 6 mg/dL | 6 mg/dL |

Urine Summary

The following analytes were tested up to the levels indicated at Calcium concentrations of 9 mg/dL and 22.8 mg/dL and found not to interfere.

**Interferents in urine samples**

| | Calcium Concentration | |
|---|---|---|
| **Interferent** | **9 mg/dL** | **22.8 mg/dL** |
| Haemoglobin | 250 mg/dl | 250 mg/dl |
| Total Bilirubin | 60 mg/dl | 60 mg/dl |
| Conjugated Bilirubin | 60 mg/dl | 60 mg/dl |
| Ascorbic Acid | 200 mg/dl | 200 mg/dl |
| Ethanol | 1000 mg/dl | 1000 mg/dl |
| Boric Acid | 1000 mg/dl | 1000 mg/dl |
| Gamma Globulin | 500 mg/dl | 2000 mg/dl |
| Glucose | 2000 mg/dl | 2000 mg/dl |
| Human Serum Albumin | 500 mg/dl | 500 mg/dl |
| Sodium Oxalate | 100 mg/dl | 100 mg/dl |
| Sodium Fluoride | 1000 mg/dl | 1000 mg/dl |
| Sodium Chloride | 4000 mg/dl | 4000 mg/dl |

*d. Method comparison with predicate device:*

Correlation studies were carried out in accordance with C.L.S.I. guideline EP09-A2 ‘Measurement Procedure Comparison and Bias Estimation Using Patient Samples; Approved Guideline – Third Edition.’

Serum Correlation

111 serum patient samples spanning the range 1.00 to 15.87 mg/dL (0.25 to 3.96 mmol/l) were tested on the RX daytona plus analyzer with each sample tested in singlicate. The test method was compared to the predicate device and the following linear regression equation was obtained:

y = 0.99x - 0.10

Correlation coefficient of r = 0.99

Urine Correlation

100 urine patient samples spanning the range 1.20 to 31.78 mg/dL (0.3 to 7.93 mmol/l), were tested on the RX daytona plus analyzer with each sample tested in singlicate. The test method was compared to the predicate device and the following linear regression equation was obtained:

y = 0.98 x - 0.24

Correlation coefficient of r = 0.99

*e. Matrix comparison (Serum vs Plasma)*

Matrix method comparison for the Calcium assay was tested on one RX daytona Plus system and was assessed for two lots of Calcium reagents. Both serum (x) and lithium heparin plasma (y) were tested to determine whether method accuracy with lithium heparin specimens is equivalent to serum results and that lithium heparin plasma does not interfere with either the method or the system.

Patient samples were drawn in matched pairs – one sample serum (x) and the second sample lithium heparin plasma (y). 47 matched patient sample pairs were analyzed in singlicate spanning the range 1.00 to 14.11 mg/dL and the following linear regression equation was obtained:

y = 0.97 x + 0.22

Correlation coefficient of r = 0.99

## 10. CONCLUSION

Testing results indicate that the proposed device (RANDOX CALCIUM (Ca)) is safe and effective for the stated intended use and is substantially equivalent to the predicate device.