July 26, 2019

Healthy.io Ltd
Ron Zohar
Chief Product Officer
2 Ibn Gabirol Street
Tel Aviv, 6407702
Israel

Re: K182384
Trade/Device Name: ACR | LAB Urine Analysis Test System
Regulation Number: 21 CFR 862.1225
Regulation Name: Creatinine test system
Regulatory Class: Class II
Product Code: JFY, JIR, KQO
Dated: June 25, 2019
Received: June 25, 2019

Dear Ron Zohar:

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/combination-products/guidance-regulatory-information/postmarketing-safety-reporting-combination-products); 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 https://www.fda.gov/medical-devices/medical-device-safety/medical-device-reporting-mdr-how-report-medical-device-problems.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance) and CDRH Learn (https://www.fda.gov/training-and-continuing-education/cdrh-learn). 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 (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/contact-us-division-industry-and-consumer-education-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 Kelm, Ph.D.
Acting Director
Division of Chemistry and Toxicology Devices
OHT7: Office of In Vitro Diagnostics
and Radiological Health
Office of Product Evaluation and Quality
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)*
K182384

Device Name
ACR | LAB Urine Analysis Test System

Indications for Use *(Describe)*

The ACR | LAB Urine Analysis Test System is comprised of a smartphone application, a proprietary Color-Board, and ACR Reagent Strips. It is intended for the semi-quantitative detection of albumin and creatinine in urine, as well as the presentation of their ratio. The ACR | LAB Urine Analysis Test System is intended for in-vitro diagnostic use by a healthcare professional in a point of care setting. These results may be used in conjunction with clinical evaluation as an aid in the diagnosis for kidney function.

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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Attachment 3

510(K) SUMMARY

Healthy.io's ACR | LAB Urine Analysis Test System k182384

Submitter

Healthy.io Ltd.
2 Ibn Gabirol St.
Tel Aviv, 6407702 Israel
Phone: +972-54-445-4514
Fax: +972-77-470-4808
Contact Person: Ron Zohar

Date Prepared: July 2019

Name of Device: ACR | LAB Urine Analysis Test System

Common or Usual Name: Smartphone enabled albumin-creatinine ratio analyzer

Regulation Section and Classification Name:

Class I: Albumin
Class II: Creatinine
21 CFR § 862.1645 Urinary protein or albumin (non-quantitative) test system
21 CFR § 862.1225 Creatinine test system
21 CFR § 862.2900 Automated urinalysis system

Product Code:

JIR
JFY
KQO

Classification Panel: Clinical Chemistry

Predicate Device:

The ACR | LAB is substantially equivalent to the following predicate device:

Manufacturer	Device	510(k) Number
ACON Laboratories Inc.	Mission U120 Ultra Urine Analyzer and Mission Urinalysis Reagent Strips (Microalbumin/Creatinine)	k142391

Device Description:

The ACR | LAB Urine Analysis Test System is comprised of a smartphone application, a proprietary Color-Board and ACR Reagent Strips. It is intended for the semi-quantitative detection of albumin and creatinine in urine, as well as the presentation of their ratio.
The device is provided as a kit that is comprised of a canister of 100 FDA-cleared urine test strips (ACON Laboratories Inc. Mission Urinalysis Reagent Strips (Microalbumin/Creatinine) k150330), 10 Color-Boards, and a User Manual. The ACR | LAB Urine Analysis Test System also consists of a smartphone application for use on iPhone 7 device (iOS 12), and an image recognition algorithm running on the Backend[1].

The software component of the ACR | LAB consists of both an application (App) and a Backend server (Backend). The App instructs the professional user how to accurately perform the test. The App conducts a series of boundary condition analyses, and if the scan is approved, sends the information to the Backend for complete analysis and results classification. Once analyzed, the results are securely transmitted to a patient Electronic Medical Record for review by a healthcare professional. The patients do not have access to the results at any point during the testing process.

Device Components:

The ACR | LAB Urine Analysis Test System is comprised of the following components:

1. A canister of 100 Mission Urinalysis Reagent Strips U031-021 (ACON Laboratories Inc., k150330)
2. Ten individually wrapped Color-Boards
3. A smartphone App
4. A backend, cloud-based server
5. A user manual
6. iPhone 7 with iOS 12 (not provided)

Intended Use/Indication for Use:

The ACR | LAB Urine Analysis Test System is comprised of a smartphone application, a proprietary Color-Board, and ACR Reagent Strips. It is intended for the semi-quantitative detection of albumin and creatinine in urine, as well as the presentation of their ratio. The ACR | LAB Urine Analysis Test System is intended for in-vitro diagnostic use by a healthcare professional in a point of care setting. These results may be used in conjunction with clinical evaluation as an aid in the diagnosis for kidney function.

Comparison of ACR | LAB and ACON Laboratories' Mission U120 Ultra Urine Analyzer:

Table 1 below summarizes similarities and variabilities between the ACR | LAB and its predicate device, ACON Laboratories' Mission U120 Ultra Urine Analyzer and Mission Urinalysis Reagent Strips (Microalbumin/Creatinine) (k142391).

[1] Backend will henceforth refer to the system's cloud-based servers, which run the server-side algorithms, and turn the algorithms' analysis into clinical results. These are then securely transmitted to a patient Electronic Medical Record. The ACR | LAB Backend is HIPAA compliant and uses advanced security protocols for data handling and transmission.

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Table 1: *Comparison between ACR | LAB Urine Analysis Test System and the ACON Laboratories' Mission U120 Ultra Urine Analyzer (k142391)*

Feature	**Healthy.io's ACR | LAB Urine Analysis Test System (k182384)**	**ACON Laboratories' Mission U120 Ultra Urine Analyzer and strips (k142391)**
Intended Use	The ACR | LAB Urine Analysis Test System is comprised of a smartphone application, a proprietary Color-Board, and ACR Reagent Strips. It is intended for the semi-quantitative detection of albumin and creatinine in urine, as well as the presentation of their ratio. The ACR | LAB Urine Analysis Test System is intended for in-vitro diagnostic use by a healthcare professional in a point of care setting. These results may be used in conjunction with clinical evaluation as an aid in the diagnosis for kidney function.	The Mission® U120 Ultra Urine Analyzer is a uranalysis instrument intended for in vitro diagnostic use. It is intended for professional use only at point-of-care locations. The Mission U120 Ultra Urine Analyzer is intended to read Mission® Urinalysis Reagent Strips (Microalbumin/Creatinine) for the semi-quantitative measurement of albumin and creatinine. These measurements are used to assist diagnosis for kidney function.
Test Specimen	Urine	Urine
Detection Methodology	Reflectance Photometry	Reflectance Photometry
Detection device	Photosensitive Diode	Photosensitive Diode
Operating Conditions	0-35°C (32-95°F); ≤93% Humidity (non-condensing)	0-40ºC (32-104ºF); ≤85% Humidity (non-condensing)
Strips to be used	Mission Urinalysis Reagent Strips U031-021 (k150330)	Mission Urinalysis Reagent Strips U031-021
Strip Operating Conditions	15-30°C [59°-86°F] 20%-80% Relative humidity (non-condensing)	15-30°C [59°-86°F] 20%-80% Relative humidity (non-condensing)
Strip Incubation Time	1 minute	1 minute
Calibration	Automatic	Automatic
Power Source	Not Applicable	6 AA batteries 100- 240 VAC (adapter), (46-65 Hz± 1HZ)
Line Leakage Current	Not Applicable	<2.5mA
Data Transfer	Via internet connection from the Backend to the dedicated smartphone as well as to a patient Electronic Medical Record (EMR)	USB port (data communications); Standard RS232C port for barcode reader or data transfer or external printer
Capabilities	Transmission to EMR via internet connection	Internal printer (included) 25 pin parallel external printer port

Feature	Healthy.io's ACR | LAB Urine Analysis Test System (k182384)	ACON Laboratories' Mission U120 Ultra Urine Analyzer and strips (k142391)
		connector (included) barcode reader (optional) RS232C barcode reader Bluetooth adapter Ethernet via USB to RJ45 adapter USB wireless net-card (optional) SD card or USB flash drive for software update
Available languages on screen	English (others as installed)	English (default) and additional languages
Measuring cycle	Approximately 1 minute per test	Approximately 1 minute per test
Smartphones	iPhone 7	Not Applicable
Operating Systems	iOS 12	Not Applicable
Dimensions	5.0 cm (H) x 23.2 cm (W) x 18.5 (L)	260 mm (L) x 150 mm (W) x 175 mm (W)
Weight	<380 g (not including the dedicated smartphone)	< 1.66 kg without batteries or power supply

Summary of Equivalence Discussion:

ACR | LAB and its predicate device, ACON Laboratories' Mission U120 Ultra Urine Analyzer (k142391), both are intended for prescription, in vitro diagnostic use by a healthcare professional in a point of care setting, with test results reviewed by a clinician for further care. The Method Comparison study results and bench test results demonstrate substantial equivalence and provide evidence for the safety and effectiveness of the ACR | LAB Urine Analysis Test System in comparison to the ACON Laboratories' Mission U120 Ultra Urine Analyzer and Mission Urinalysis Reagent Strips (Microalbumin/Creatinine) (k142391).

Summary of Performance Data:

Healthy.io conducted both bench and clinical studies to test the accuracy of the ACR | LAB Analysis Test System and its agreement with its predicate device. These analytical and clinical performance studies (conducted in three independent point of care clinical sites in the United States) as well as the software validation testing are summarized below.

Analytical Performance Testing:

The performance characteristics of the ACR | LAB Urine Analysis Test System were evaluated by the following analytical performance tests:

Precision. This study was comprised of two separate sub-studies, including: 1) Repeatability; and 2) Reproducibility. The precision studies were designed and executed in accordance with guidance provided by Clinical and Laboratory Standards Institute document *EP05-A3 – Evaluation of Precision of Quantitative Measurement Procedures; Approved Guideline – Third Edition*.

- The Repeatability study was conducted at three sites over the course of one day. Each operator tested three spiked levels of urine using twenty ACR Reagent Strips (Strips) from three lots on a dedicated iPhone 7 device. For each analyte, 189 total tests were performed during the Repeatability study (189 = 3 sites X 3 solutions X 3 lots X 7 strips X 1 phones). The ACR | LAB device recorded an exact match of 100% during the study.

- The Reproducibility study was conducted at three sites over the course of 20 days, with test operators switching locations every six-to-seven days. For every run, each operator used a dedicated iPhone 7 device to test three spiked levels of urine. To do this, the operator used three Strips per sample, one Strip each from three separate lots. Five devices were used throughout course of the study. These were rotated, with three phones used on any given day. For each analyte, 1,080 total tests were taken during the Reproducibility study (3 sites x 3 solutions X 3 lots x 2 runs x 20 days x 1 device). The ACR | LAB device recorded an exact match of 99.8% during the course of the study.

Interference. Testing of potential interfering substances with the ACR | LAB Urine Analysis Test System was designed and executed in accordance with guidance provided by Clinical and Laboratory Standards Institute document *EP07 – Interference Testing in Clinical Chemistry – Third Edition*; and *EP37 - Supplemental Tables for Interference Testing in Clinical Chemistry, 1st Edition.*

- Interference was defined as a change in output of ≥ 1 color block between spiked and unspiked (control) samples. Once interference was detected, a dose-response study was carried out at three decreasing intervals to determine the lowest concentration level that causes interference. Interfering substances and their lowest concentrations causing interference were identified and listed in the accompanying User Manual.

Limit of Detection. Testing of the ACR | LAB Urine Analysis Test System Limits of Detection was designed and executed in accordance with guidance provided by Clinical and Laboratory Standards Institute (CLSI) document *EP17-A2 – Evaluation of Detection Capability for Clinical Laboratory Measurement Procedures; Approved Guideline – Second Edition*.

- The Limit of Detection study was based on validated spiked or diluted urine solutions at known concentrations for each analyte. The samples were adjusted to concentrations that were divided into four equivalent intervals between the stated cut-off blocs. The cut-off for each block is defined as the lowest concentration at which >55% of the results were positive.

Linearity. The linearity study of the ACR | LAB Urine Analysis Test System was designed and executed in accordance with guidance provided by the Clinical and Laboratory Standards Institute (CLSI) document *EP6-A – Evaluation of Linearity of Quantitative Measurement Procedures: A Statistical Approach; Approved Guideline*.

- The Linearity study tested the ability of the ACR | LAB Urine Analysis Test System to provide results that are directly proportional to the concentrations of analytes within each test sample. The study tested the entire range of values that the ACR | LAB Urine Analysis Test System is designed to measure. These expected values were presented against actual device results. Both of the analytes demonstrated a linear relationship between variables, with no biases disrupting the overall pattern of linearity.

Timing Flex Study. This experiment essentially consists of four different studies: 1. carry-over; 2. dipping; 3. wetting (blotting); and 4. assay-time; and was designed to evaluate how the timing of dipping, wetting, and blotting, as well as carry-over of the Strips impacts the ability of the ACR | LAB Urine Analysis Test System to accurately measure the levels of albumin and creatinine in a urine sample. The framework of this study is based primarily on similar studies of devices with similar indications for use.

- Carry-Over. In this study, strips were held in both the "up" (with the creatinine on top) and "down" (with the albumin on top) positions for different time intervals after being dipped in spiked solutions. None of the carry-over time durations, in both "up" and "down" configurations had any impact on the ACR | LAB's ability to measure accurate results. The study used the most extreme cases, testing for high-positive "run-off" into low-positive patches.

- Wetting (Blotting) Time: This experiment tested six different "blotting" times, i.e. the tester dipped the Strip and then waited a specific amount of time (0-, 5-, 10-, 20-, 40- and 60-seconds) before blotting the Strip and scanning it with the ACR | LAB device. For creatinine, none of the various dipping times impacted the accuracy of the device. For albumin, waiting 60-seconds to blot the strip resulted in False Positive results. The User Manual and in-app instructions direct the professional user to dip, blot, and place the strip on the Color-Board in quick succession.

- Dipping Time. Strips were dipped in spiked solutions for four different time durations (1-, 2-, 5-, and 10-seconds) to test the impact of various dipping times on the ACR | LAB's ability to perform accurate measurements. For creatinine, none of the various dipping times impacted the accuracy of the device. For albumin, at times 5- and 10-seconds there was an increase in False Positive results. The User Manual and in-app instructions direct the professional user to dip the ACR Reagent Strip for 1-second.

- Assay Time: This experiment tested how different assay times impacted the ACR | LAB's ability to measure accurate results. Strips were dipped and then immediately blotted, per the device's instructions. The user then waited a predetermined amount of time (60-, 80-, 100-, or 120- seconds) before scanning the strip. None of the assay time durations had any impact on the ACR | LAB's ability to accurately measure albumin or creatinine. The User Manual and the in-app instructions direct the professional user to scan the Strip and Color-Board once the in-app timer has indicated that 60-seconds have elapsed.

Stability. This stability experiment was designed to test the ACR | LAB ability to provide accurate measurements after subjecting the device kit to both real time and accelerated aging timeframes and conditions that could arise during transportation (e.g. temperature, humidity and vibration). In addition, an open vial experiment was also conducted. After exposure to these transportation conditions and timeframes, the performance of the kits was evaluated through a number of functional tests. The ACR | LAB device was not affected by any of these parameters and its stability was therefore confirmed.

Clinical Performance Testing:

Method Comparison. The objective of the Method Comparison study was to test the ACR | LAB's degree of agreement with its predicate device, when operated by a professional user at a point-of-care location

The primary acceptance criteria for the study were the percent of exact match and ±1 color block match between the ACR | LAB Urine Analysis Test System and the predicate. Throughout the testing, the ACR |

LAB Urine Analysis Test System demonstrated high levels of accuracy as demonstrated by its percent of agreement with the predicate device.

Study Design

The study evaluated native urine samples from 375 subjects as well as 60 contrived samples at three U.S. clinical sites. The ACR | LAB device was provided to the study coordinators. All subjects were asked to provide a urine sample. Two separate lab technicians were responsible for measuring each urine sample. The first lab technician measured the urine sample using the iPhone 7 device; the second technician measured the urine sample using the predicate device, the ACON Laboratories' Mission U120 Ultra Urine Analyzer (U120 Ultra). Each urine sample was tested twice in total; once with the iPhone 7 device and then subsequently with the predicate device (U120 Ultra). The results of the ACR | LAB device and results measured by the predicate (U120 Ultra) were compared.

Study Results – Accuracy

The overall agreement (% exact match) between the ACR | LAB Urine Analysis Test System and the predicate device was 89% for albumin and 84% for creatinine. The overall agreement between the ACR | LAB Urine Analysis Test System and the predicate device when measuring the albumin-creatinine ratio was 93%. The ± 1 color block % agreement between the ACR | LAB Urine Analysis Test System and the predicate device was 100% for albumin, 100% for creatinine, and 100% for the albumin-creatinine ratio.

The high rates with which the ACR | LAB measured the same results as the predicate ACON Laboratories' Mission U120 Ultra Urine Analyzer demonstrate substantial equivalence between the two devices.

Software Validation:

Validation of the ACR | LAB device software was performed according to clause 14 of IEC 60601-1 (third edition) Software requirements, IEC 62304:2004 to IEC 62304 – 2006/AC 2008, Medical device, and Software life-cycle processes standards. The software related documents were composed according to the specific IEEE standards and the FDA Guidance for the Content of Premarket Submissions for Software Contained in Medical Devices. The Software Validation documents summarize the validation assessment and demonstrate that the software meets the design requirements and all potential risks have been mitigated.

In accordance with the FDA's guidance for management of cyber-security in medical devices, the OCR's HIPAA regulation and ISO 27001:2013, Healthy.io conducted a comprehensive hazard analysis. The cyber security analysis report, together with the cyber security validation test report summarizes the assessment process for cyber security and demonstrates that the software meets the required level of cyber security protection.

Conclusions:

The clinical and analytical performance study results demonstrate that the ACR | LAB Urine Analysis Test System is substantially equivalent to the predicate device Mission® U120 Ultra Urine Analyzer and Mission Urinalysis Reagent Strips (Microalbumin/Creatinine) (FDA 510(k): k142391).