DEPARTMENT OF HEALTH & HUMAN SERVICES Public Health Service

Food and Drug Administration
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Silver Spring, MD 20993-0002

ASTUTE MEDICAL, INC.
C/O JANICE HOGAN, PARTNER
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1835 MARKET STREET, 29TH FLOOR
PHILADELPHIA PA 19103

June 9, 2016

Re: K153165
Trade/Device Name: NEPHROCHECK Test System
Regulation Number: 21 CFR 862.1220
Regulation Name: Acute Kidney Injury Test System
Regulatory Class: II
Product Code: PIG
Dated: May 3, 2016
Received: May 3, 2016

Dear Janice Hogan:

This letter corrects our substantially equivalent letter of June 1, 2016.

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 Parts 801 and 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.

If you desire specific advice for your device on our labeling regulations (21 CFR Parts 801 and 809), please contact the Division of Industry and Consumer Education at its toll-free number (800) 638 2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm. 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.

You may obtain other general information on your responsibilities under the Act from the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm.

Sincerely yours,

Katherine Serrano -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: January 31, 2017
See PRA Statement on last page

510(k) Number *(if known) K153165*

Device Name
NEPHROCHECK® Test System

Indications for Use *(Describe)*

The Astute Medical NEPHROCHECK® Test System is intended to be used in conjunction with clinical evaluation in patients who currently have or have had within the past 24 hours acute cardiovascular and or respiratory compromise and are ICU patients as an aid in the risk assessment for moderate or severe acute kidney injury (AKI) within 12 hours of patient assessment. The NEPHROCHECK® Test System is intended to be used in patients 21 years of age or older.

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)

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510(k) SUMMARY

Astute Medical Inc.'s Modified NEPHROCHECK® Test System

Submitter's Name, Address, Telephone Number, Contact Person and Date Prepared

Astute Medical, Inc.

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Contact Person: Karin A. Hughes, Ph.D.

Date Prepared: May 13, 2016

Name of Device:

NEPHROCHECK® Test System

Common or Usual Name:

NEPHROCHECK® Test System

Classification Name:

Acute Kidney Injury Test System (21 C.F.R. 862.1220, Product Code PIG)

Panel:

Clinical Chemistry

Device Classification:

Class II

Predicate Device:

Name: NEPHROCHECK® Test System

Device Company: Astute Medical, Inc.

510(k) Number: K131650

De Novo Number: DEN130031

Purpose of the Special 510(k) Notice:

The modified NEPHROCHECK® Test System is a modification to the previously cleared NEPHROCHECK® Test System. Modifications included in this Special 510(k) submission include:

- Labeling changes to the NEPHROCHECK® Test instructions for use add myoglobin as a substance that does *not* exhibit interference with the AKIRisk Score in the "Interfering Substances" section of the Performance Characteristics section.
- Labeling changes to the "Storage and Handling Requirements" section of the NEPHROCHECK® Test instructions for use to describe the stability of the NEPHROCHECK® Test Kit when stored refrigerated.
- Addition of a second supplier for anti-IGFBP-7

Indication for Use:

The Astute Medical NEPHROCHECK® Test System is intended to be used in conjunction with clinical evaluation in patients who currently have or have had within the past 24 hours acute cardiovascular and or respiratory compromise and are ICU patients as an aid in the risk assessment for moderate or severe acute kidney injury (AKI) within 12 hours of patient assessment. The NEPHROCHECK® Test System is intended to be used in patients 21 years of age or older.

Device Description:

The Astute NEPHROCHECK® Test System is comprised of the NEPHROCHECK® Test Kit, the ASTUTE140® Meter Kit, NEPHROCHECK® Liquid Controls Kit and the NEPHROCHECK® Calibration Verification (Cal Vers) Kit. The system is designed to be used by trained medical professionals in the central laboratory.

The NEPHROCHECK® Test Kit, includes the NEPHROCHECK® Test which is a single-use cartridge comprised of two immunoassays for the protein biomarkers, insulin-like growth factor-binding protein (IGFBP7) and tissue-inhibitor of metalloproteinases 2 (TIMP-2) on a membrane test strip enclosed in a plastic housing. The concentrations of the TIMP-2 and IGFBP-7 proteins are used to derive an AKIRISK™ Score. The test procedure involves the operator applying a clinical urine sample mixed with labeled fluorescent conjugate to the NEPHROCHECK® Test cartridge, and then inserting the Test cartridge into the ASTUTE140® Meter for incubation, reading, result calculation and result display. Internal positive and negative procedural controls in each NEPHROCHECK® Test cartridge monitor the function of each test cartridge. If the automatic check of these procedural controls shows that the control value results are not within pre-defined limits, the ASTUTE140® Meter will display an error message and the Test result will not be reported.

Included in the NEPHROCHECK® Test is test buffer and the NEPHROCHECK® Test Conjugate Vial which contains murine monoclonal and goat polyclonal antibodies against TIMP-2 and IGFBP-7, fluorescent dye, stabilizers and excipients. Each Kit has the materials necessary to perform 25 tests. Each NEPHROCHECK® Test Kit also contains a lot-specific radio-frequency identification (RFID) card containing lot and calibration information. The RFID card information must be loaded prior to using a new Test kit lot.

The ASTUTE140® Meter is a bench-top analyzer that converts the fluorescent signal from each of the two immunoassays (TIMP-2 and IGFBP7) contained within the NEPHROCHECK® Test cartridge into the AKIRISK™ Score. The NEPHROCHECK® Test result is displayed on the Meter LCD screen in approximately 20 minutes from the addition of the specimen. Only the AKIRISK™ Score appears on the Meter display. The ASTUTE140® Meter contains an internal printer that can print the AKIRisk score.

The NEPHROCHECK® Low Liquid Control and NEPHROCHECK® High Liquid Control are bi-level, lyophilized control materials prepared from human urine containing human TIMP-2 and human IGFBP7 proteins with protein stabilizers. TIMP-2 and IGFBP-7 proteins have been added to the urine to achieve specified target concentration levels. Each NEPHROCHECK® Liquid Controls Kit also contains a high and low RFID encoded with the Liquid Control Kit lot number, expiration date, and the expected range of concentration values based on $\pm$ two standard deviations in the measurement of each protein biomarker (TIMP-2 and IGFBP-7) in each Liquid Control level. Each NEPHROCHECK® Liquid Control Kit Vial is intended for single use only.

The NEPHROCHECK® Calibration Verification Kit includes five levels of lyophilized material prepared from human urine, containing TIMP-2 and human IGFBP-7 to achieve specified target concentration levels that evenly span the reportable range of the AKIRISK™ Score. The expected concentrations and standard deviations of the individual biomarkers are printed on an enclosed Expected Values Card.

Technological Characteristics:

The modified NEPHROCHECK® Test System has very similar technological characteristics as the previously cleared NEPHROCHECK® Test System, to which it is a modification. There have been no changes to the technological features between the modified NEPHROCHECK® Test System and the previously cleared NEPHROCHECK® Test System; the minor differences between the modified NEPHROCHECK® Test System and the previously cleared NEPHROCHECK® Test System do not raise any new questions of safety or effectiveness. The NEPHROCHECK® Test System final release specifications as cleared in DEN130031/K131650 are not impacted by these minor changes. Bench testing was conducted and the results from this testing demonstrate that the modified NEPHROCHECK® Test System is substantially equivalent to the previously cleared NEPHROCHECK® Test System ("predicate device").

Modifications included in this Special 510(k) submission include:

- Labeling changes to the NEPHROCHECK® Test instructions for use to add myoglobin as a substance that does *not* exhibit interference with the AKIRisk™ Score in the "Interfering Substances" section of the Performance Characteristics section.

- Labeling changes to the “Storage and Handling Requirements” section of the NEPHROCHECK® Test instructions for use to describe the stability of the NEPHROCHECK® Test Kit and components.
- Addition of a second supplier for anti-IGFBP-7 antibody

Performance Data:

The modified NEPHROCHECK® Test Kit was tested to verify its’ performance for the following parameters:

Study	Standards Referenced
NEPHROCHECK® Test Kit - Interfering Substances – Myoglobin	• CLSI EP07-A2:2005, Interference Testing in Clinical Chemistry; Approved Guideline- 2nd Edition
NEPHROCHECK® Test Kit – Shelf-Life 2-8^{o}C Storage and Ambient Shipping	• CLSI EP25-A:2009 Evaluation of Stability of In Vitro Diagnostic Reagents; Approved Guideline; • BS EN ISO 23640:2013 Stability testing of in vitro diagnostic reagent; • ASTM D4332-13 Standard Practice for Conditioning Containers, Packages, or Packaging Components for Testing; • ISTA 7E:2010 Testing Standard for Thermal Transport Packaging Used in Parcel Delivery System Shipment
NEPHROCHECK® Test Kit – Buffer Open-Bottle Shelf-Life	• CLSI EP25-A:2009 Evaluation of Stability of In Vitro Diagnostic Reagents; Approved Guideline; • BS EN ISO 23640:2013 Stability testing of in vitro diagnostic reagent; • ASTM D4332-13 Standard Practice for Conditioning Containers, Packages, or Packaging Components for Testing; • ISTA 7E:2010 Testing Standard for Thermal Transport Packaging Used in Parcel Delivery System Shipment
NEPHROCHECK® Test Kit – Manufacturing and End-User Room Temperature Handling (Post 2-8^{o}C Storage)	• CLSI EP25-A:2009 Evaluation of Stability of In Vitro Diagnostic Reagents; Approved Guideline; • BS EN ISO 23640:2013 Stability testing of in vitro diagnostic reagent; • ASTM D4332-13 Standard Practice for Conditioning Containers, Packages, or Packaging Components for Testing; • ISTA 7E:2010 Testing Standard for Thermal Transport Packaging Used in Parcel Delivery System Shipment

Study	Standards Referenced
NEPHROCHECK® Test Kit – Effect of Cycling Between 2-8°C Storage and Room Temperature	• EP07-A2:2005 Interference Testing in Clinical Chemistry; Approved Guideline-2nd Edition.
Time of the NEPHROCHECK® Test Cartridge to Reach Operating Temperature After 2-8°C Storage	• EP07-A2:2005 Interference Testing in Clinical Chemistry; Approved Guideline-2nd Edition.
NEPHROCHECK® Test Kit - Zero Equilibration Time Study	• EP07-A2:2005 Interference Testing in Clinical Chemistry; Approved Guideline-2nd Edition.
NEPHROCHECK® Test Kit - Packaging Material Environmental Cycling Study	• ASTM D4332-13 Standard Practice for Conditioning Containers, Packages, or Packaging Components for Testing
Addition of a second supplier for anti-IGFBP-7	• CLSI EP17-A2, Evaluation of Detection Capability for Clinical Laboratory Measurement Procedures; Approved Guideline—Second Edition

The NEPHROCHECK® Test Kit met its specifications. No new risks were introduced by the minor modifications described in this submission.

Substantial Equivalence

The company's modified NEPHROCHECK® Test System is a modification to the previously cleared NEPHROCHECK® Test System (DEN130031/K131650)**,** which was cleared in September 2014**.** The modified NEPHROCHECK® Test System has the same intended use and indications for use, similar principles of operation, and similar technological characteristics as the previously cleared predicate NEPHROCHECK® Test System. The only labeling modifications that are being implemented for the modified device are minor updates to indicate that myoglobin is not a potential interferent, and to modify the storage conditions to specify refrigeration. None of these changes impact the indications, contraindications, warnings or precautions for the device. Thus, the modified NEPHROCHECK® Test System is substantially equivalent to its predicate.

Conclusions

The modified NEPHROCHECK**®** Test System is substantially equivalent to the predicate NEPHROCHECK**®** Test System.