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Aerocrine

SPECIAL 510(k) SUMMARY - NIOX MINO, K101034

Doc ID RFD-000165-02 / August 30, 2010

SEP 2 2010

1) Submitter's Identification

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Summary preparation date:	August 30, 2010

2) Special 510(k) application for Device

2a) Device information:

Trade name	NIOX MINO®
Common/Generic Device Name	Airway inflammation monitor
Initial 510(k) number	K072816
510(k) number, device modification:	K101034
Classification Name	Breath Nitric Oxide Test System
Device Class	II
Product Code	MXA
Regulation number	21 CFR 862.3080
Medical Specialty	CH, Clinical Chemistry
Owner/Operator	AEROCRINE AB
Owner/Operator number	9057041
Establishment Operations	Specification Developer, Manufacturer

2b) Justification for a Special 510(k):
This application represents a modification to the 510(k) cleared device NIOX MINO, K072816.

Following the FDA guidance document "The New 510(k) paradigm – alternate approaches to demonstrating substantial equivalence in premarket notifications", from March 20, 1998.

1) The device for this application represents a modification to the 510(k) cleared device NIOX MINO, K072816.
2) The Intended Use is identical to the Intended Use for the 510(k) cleared device NIOX MINO, K072816
3) The fundamental scientific technology is identical to the 510(k) cleared device NIOX MINO, K072816.
4) The modification is considered appropriate for reliance on results from design control process.
5) Design validation for the change has been /is being performed.
6) Conformance to Special Control guidance 21 CFR 862.3080 "Breath Nitric Oxide Test system, issued July 7, 2003. (Product Code MXA) is assured.

3) Substantial equivalence is claimed to Predicate Device:

Trade Name of Predicate Device	NIOX®
Common/ Generic Device Name	Nitric Oxide Breath Analyzer
Classification Name	Breath Nitric Oxide Test System
Device Class	II
Product Code	MXA
Regulation number	21 CFR 862.3080
Medical Speciality	CH, Clinical Chemistry
Owner/Operator	AEROCRINE AB
Owner/Operator number	9057041
Establishment Operations	Specification Developer, Manufacturer
510(k) Number	K072816

4) Device Description:

NIOX MINO is a small, hand-held, portable system for the non-invasive, online, quantitative measurement of the fractional nitric oxide (NO) concentration in expired human breath (FE_{NO}) measured in parts per billion levels (ppb). The device is intended for routine clinical use and is suitable for point of care settings.

Measurement of changes in the FE_{NO} concentration is used in evaluating an asthma patient's response to anti-inflammatory therapy, as an adjunct to established clinical and laboratory assessments of asthma. All results are to be interpreted in conjunction with other clinical and laboratory assessments of the patient's condition.

The NIOX MINO unit includes a sampling and gas conditioning system and a man-machine interface (MMI). The user is guided by the built-in touch-screen display through the breathing maneuver by use of the interactive MMI. The valves and pumps of the instrument are automatically controlled to handle the inhaled sample appropriately via the instrument electronics and software program. Filtering of inhaled air eliminates contamination from ambient NO levels. A built-in flow control keeps exhalation standardized at 50 ml/s.

Results are processed using dedicated software and are expressed as the Nitric Oxide concentration in parts per billion (ppb).

To be able to verify the performance of the device and reliability of measurements, there are built-in system control procedures and a special designed External Quality Control Test Program, to be performed on a daily basis.

5) Intended Use:

NIOX MINO® measures Nitric Oxide (NO) in human breath. Nitric Oxide is frequently increased in some inflammatory processes such as asthma. The fractional NO concentration in expired breath (FE_{NO}), can be measured by NIOX MINO with assurance that such measurements are repeatable and according to guidelines for NO measurement established by the American Thoracic Society.

Measurement of FE_{NO} by NIOX MINO is a quantitative, non-invasive, simple and safe method to measure the decrease in FE_{NO} concentration in asthma patients that often occurs after treatment with anti-inflammatory pharmacological therapy, as an indication of the therapeutic effect in patients with elevated FE_{NO} levels. NIOX MINO is suitable for children, approximately 7 - 17 years, and adults 18 years and older.

FE_{NO} measurements provide the physician with means of evaluating an asthma patient's response to anti-inflammatory therapy, as an adjunct to the established clinical and laboratory assessments in asthma. NIOX MINO should only be used as directed in the User Manual and by physicians, nurses, respiratory therapists and laboratory technicians. NIOX MINO cannot be used with infants or by children approximately under the age of 7, as measurement requires patient cooperation. NIOX MINO should not be used in critical care, emergency care or in anaesthesiology.

6) Summary of technology characteristics and performed tests

Based on the feed-back from current customers and the standard practice, some minor design changes are proposed to the NIOX MINO device. The changes are mainly for improvement of Quality Assurance and improved robustness.

The Device operates after identical functionality regarding:

- Man-machine interface for the operator and patient
- Analytical sensor and sampling processing

The proposed modification is a minor control mechanism change related to the Quality Control functionality in NIOX MINO.

Fundamental Scientific Technology
The fundamental scientific technology in NIOX MINO remains unchanged:

- The analytical principle of electrochemical detection remains unchanged.
- The NO sensor design and signal processing remains unchanged.
- The principle for sample collection and sample handling inside the instrument remains unchanged.
- The principle for data presentation remains unchanged
- The measurement performance (precision, linearity, accuracy, detection limit) specifications remain unchanged.

Proposed device modifications are appropriate for reliance on the Design Control process:
Control mechanism modification related to Quality Control procedure:

1. Extended external Quality Control, (negative and positive control every day)
2. Exchangeable NO-scrubber, (for elimination of ambient NO in the patient sample.) and separate zero scrubber (for ambient air filtration for baseline control).

Other minor design changes:

3. The number of tests possible to perform with the instrument is extended from 1500 measurements to 3000 measurements. The instrument life time of 3.5 years remains unchanged. The number of tests and life time for the sensors remain unchanged.
4. Data transfer is changed to USB standard instead of irDA communication
5. Patient data storage, is changed internal memory instead of external smart cards.
6. Monitoring of ambient humidity is included as a parameter in instrument supervision, data is stored in the instrument log file.

Validation, Verification and Testing:
These design modifications, which affects both the mechanical, Hardware and Software design, are considered appropriate for reliance on the results from Aerocrine's internal Design Control process, including performed risk analysis.

Validation, verification and testing is performed, and based on recommendations in FDA Guidance document for Breath Nitric Oxide Test system, issued July 7, 2003.

Verification of system performance has been performed as a laboratory test, using gas mixtures of NO in N_2 of known concentrations.

Clinical validation and method comparison has been performed in a clinical study, named AER-039. This study is a randomized, single-centre study determining the agreement between the NIOX Flex Nitric Oxide Monitoring system and the hand-held NIOX MINO -09 device, using the 10-second exhalation mode.

The primary objective of this study was to determine the degree of agreement between the NIOX Flex Nitric Oxide Monitoring system and the hand-held NIOX MINO -09 device when measuring fractional exhaled nitric oxide using the 10-second exhalation mode and when similar conditions are considered and examinations were made as consistently as possible.

SW validation is performed according to Guidance "General Principles of Software Validation" NIOX MINO software is considered as "Moderate Concern" Software.

Electrical safety and EMC testing according to 60601-1 are performed by a third part accredited test institute, CE Cert GmbH in Germany.

The product labeling / Instructions for use has been updated to reflect the design modifications.

Validation results and conclusion:
The results from performed Validation, Verification and Testing conclude that the performance of the modified version of NIOX MINO is within the Technical Specification, initially established for NIOX MINO in application K072816.
The performance specification for the new version of NIOX MINO is presented as follows

Performance Parameter	**Specification Tolerance Limits and definition**
Linearity	Squared correlation coefficient $r^2 > 0.998$, slope 0.95 – 1.05, intercept ±3 ppb. Determination based on the regression analysis using standard gas reference samples at seven different concentration levels covering the operating measurement range.
Lowest Detection Limit	5 ppb Determination by analyzing gas concentrations around and below the detection limit. 5 ppb was the lowest detectable level
Precision	< 3 ppb of measured value < 30 ppb, < 10 % of measured value ≥ 30 ppb. Expressed as one standard deviation for replicate measurements with the same instrument, using a certified gas concentration of Nitric Oxide reference standard.
Accuracy:	± 5 ppb or max 10 % Expressed as the upper 95% confidence limit, based on absolute differences for concentrations ≤ 50 ppb and relative differences for concentrations > 50 ppb, from certified gas concentration of Nitric Oxide reference standard.
Method comparison:	< 10 ppb for values ≤ 50 ppb, < 20 % for values > 50 ppb Expressed as the difference between a NIOX MINO FE_{NO} value and the corresponding FE_{NO} value measured with NIOX instrument from Aerocrine

Performance data typical for temperature range +16 to +30 °C Humidity range 20 – 60 % RH, Pressure 1013 hPa

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food & Drug Administration
10903 New Hampshire Avenue
Building 66
Silver Spring, MD 20993

Aerocrine AB
c/o Ms. Johanna Karling
Quality Assurance & Regulatory Affairs Director
Sundbybergsvagen 9, PO Box 1024
Solna, Sweden SE-17121

SEP 2 2010

Re: k101034
Trade Name: NIOX MINO®
Regulation Number: 21 CFR §862.3080
Regulation Name: Breath Nitric Oxide Test System
Regulatory Class: Class II
Product Codes: MXA
Dated: August 2, 2010
Received: August 6, 2010

Dear Ms. Karling:

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.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to such additional controls. Existing major regulations affecting your device can be found in Title 21, Code of Federal Regulations (CFR), Parts 800 to 895. 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); and good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820).

If you desire specific advice for your device on our labeling regulation (21 CFR Part 801), please contact the Office of *In Vitro* Diagnostic Device Evaluation and Safety at (301) 796-5450. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 807.97). For questions regarding postmarket surveillance, please contact CDRH's Office of Surveillance and Biometric's (OSB's) Division of Postmarket Surveillance at (301) 796-5760. 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 Small Manufacturers, International and Consumer Assistance at its toll-free number (800) 638-2041 or (301) 796-5680 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm.

Sincerely yours,

Courtney C. Harper, Ph.D.
Director
Division of Chemistry and Toxicology
Office of *In Vitro* Diagnostic Device
Evaluation and Safety
Center for Devices and Radiological Health

Enclosure

Indications for Use

K101034

510(k) Number (if known): k101034

Device Name: NIOX MINO

Indications For Use:

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Measurement of FE_{NO} by NIOX MINO is a quantitative, non-invasive, simple and safe method to measure the decrease in FE_{NO} concentration in asthma patients that often occurs after treatment with anti-inflammatory pharmacological therapy, as an indication of the therapeutic effect in patients with elevated FE_{NO} levels. NIOX MINO is suitable for children, approximately 7 - 17 years, and adults 18 years and older.

FE_{NO} measurements provide the physician with means of evaluating an asthma patient's response to anti-inflammatory therapy, as an adjunct to the established clinical and laboratory assessments in asthma. NIOX MINO should only be used as directed in the NIOX MINO User Manual and the NIOX MINO Quality Control Test User Manual, by trained physicians, nurses, respiratory therapists and laboratory technicians. NIOX MINO cannot be used with infants or by children approximately under the age of 7, as measurement requires patient cooperation. NIOX MINO should not be used in critical care, emergency care or in anaesthesiology.

Prescription Use ___x____ AND/OR Over-The-Counter Use _____
(Part 21 CFR 801 Subpart D) (21 CFR 807 Subpart C)

(PLEASE DO NOT WRITE BELOW THIS LINE; CONTINUE ON ANOTHER PAGE IF NEEDED)

Concurrence of CDRH, Office of In Vitro Diagnostic Device Evaluation and Safety (OIVD)

Division Sign-Off
Office of In Vitro Diagnostic Device
Evaluation and Safety

510(k) K101034