



BioFire Diagnostics, LLC
Kristen J. Kanack, Ph.D.
Vice President of Regulated Products and Clinical Affairs
390 Wakara Way
Salt Lake City, UT 84108

October 3, 2016

Re: K152579
Trade/Device Name: FilmArray[®] Respiratory Panel EZ (RP EZ)
Regulation Number: 21 CFR 866.3980
Regulation Name: Respiratory Viral Panel Multiplex Nucleic Acid Assay
Regulatory Class: II
Product Code: OCC, OEM, OOU, OEP, OTG, OQW, OOI, OZZ, OZY, OZX
Dated: June 2, 2016
Received: June 3, 2016

Dear Dr. Kanack:

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,


Uwe Scherf -S

Uwe Scherf, M.Sc., Ph.D.

Director

Division of Microbiology Devices

Office of *In Vitro* Diagnostics

and Radiological Health

Center for Devices and Radiological Health

Enclosure

Indications for Use

510(k) Number (if known)
K152579

Device Name
FilmArray[®] Respiratory Panel EZ (RP EZ)

Indications for Use (Describe)

FilmArray Respiratory Panel EZ (RP EZ) is a multiplexed nucleic acid test intended for use with the FilmArray 2.0 EZ Configuration instrument for the simultaneous qualitative detection and identification of multiple respiratory viral and bacterial nucleic acids in nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections. The following organism types and subtypes are identified using the FilmArray RP EZ: Adenovirus, Coronavirus, Human Metapneumovirus, Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype H1-2009, Influenza B, Parainfluenza Virus, Human Rhinovirus/Enterovirus, Respiratory Syncytial Virus, *Bordetella pertussis*, *Chlamydomphila pneumoniae*, and *Mycoplasma pneumoniae*. The detection and identification of specific viral and bacterial nucleic acids from individuals exhibiting signs and symptoms of a respiratory infection aids in the diagnosis of respiratory infection if used in conjunction with other clinical and epidemiological information. The results of this test should not be used as the sole basis for diagnosis, treatment, or other management decisions. Negative results in the setting of a respiratory illness may be due to infection with pathogens that are not detected by this test or, lower respiratory tract infection that is not detected by a nasopharyngeal swab specimen. Positive results do not rule out co-infection with other organisms: the agent(s) detected by the FilmArray RP EZ may not be the definite cause of disease. Additional laboratory testing (e.g. bacterial and viral culture, immunofluorescence, and radiography) may be necessary when evaluating a patient with possible respiratory tract infection.

Due to the small number of positive specimens collected for certain organisms during the prospective clinical study, performance characteristics for *Bordetella pertussis*, Coronavirus, Influenza A H1, Influenza A H3, Influenza A H1-2009, Influenza B, *Mycoplasma pneumoniae*, and Parainfluenza Virus were established primarily with retrospective clinical specimens. Performance characteristics for *Chlamydomphila pneumoniae* were established primarily using contrived clinical specimens.

Due to the genetic similarity between Human Rhinovirus and Enterovirus, the FilmArray RP EZ cannot reliably differentiate them. A positive FilmArray RP EZ Rhinovirus/Enterovirus result should be followed-up using an alternate method (e.g., cell culture or sequence analysis) if differentiation is required.

Performance characteristics for Influenza A were established when Influenza A H1-2009, A H1, and A H3 were the predominant Influenza A viruses in circulation. Performance of detecting Influenza A may vary if other Influenza A strains are circulating or a novel Influenza A virus emerges. If infection with a novel Influenza A virus is suspected based on current clinical and epidemiological screening criteria recommended by public health authorities, specimens should be collected with appropriate infection control precautions for novel virulent influenza viruses and sent to state or local health departments for testing. Viral culture should not be attempted in these cases unless a BSL 3+ facility is available to receive and culture specimens.

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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510(k) Summary
BioFire Diagnostics, LLC

FilmArray Respiratory Panel EZ (RP EZ)

Introduction: According to the requirements of 21 CFR 807.92, the following information provides sufficient detail to understand the basis for a determination of substantial equivalence.

Submitted by:

BioFire Diagnostics, LLC
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Contact: Kristen Kanack, ext. 330

Date Submitted: September 04, 2015

Device Name and Classification:

Trade Name: FilmArray Respiratory Panel EZ (RP EZ)

Regulation Number: 21 CFR 866.3980

Classification Name: Respiratory Viral Panel Multiplex Nucleic Acid Assay

Product Codes: OCC, OEM, OOU, OEP, OTG, OOI, OZX, OZY, OQW and OZZ

Predicate Device:

K143080 – FilmArray Respiratory Panel for use with FilmArray 2.0 System and FilmArray Injection Vials

Intended Use:

FilmArray Respiratory Panel EZ (RP EZ) is a multiplexed nucleic acid test intended for use with the FilmArray 2.0 EZ Configuration instrument for the simultaneous qualitative detection and identification of multiple respiratory viral and bacterial nucleic acids in nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections. The following organism types and subtypes are identified using the FilmArray RP EZ: Adenovirus, Coronavirus, Human Metapneumovirus, Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype H1-2009, Influenza B, Parainfluenza Virus, Human Rhinovirus/Enterovirus, Respiratory Syncytial Virus, *Bordetella pertussis*, *Chlamydomphila pneumoniae*, and *Mycoplasma pneumoniae*. The detection and identification of specific viral and bacterial nucleic acids from individuals exhibiting signs and symptoms of a respiratory infection

aids in the diagnosis of respiratory infection if used in conjunction with other clinical and epidemiological information. The results of this test should not be used as the sole basis for diagnosis, treatment, or other management decisions. Negative results in the setting of a respiratory illness may be due to infection with pathogens that are not detected by this test or, lower respiratory tract infection that is not detected by a nasopharyngeal swab specimen. Positive results do not rule out co-infection with other organisms: the agent(s) detected by the FilmArray RP EZ may not be the definite cause of disease. Additional laboratory testing (e.g. bacterial and viral culture, immunofluorescence, and radiography) may be necessary when evaluating a patient with possible respiratory tract infection.

Due to the small number of positive specimens collected for certain organisms during the prospective clinical study, performance characteristics for *Bordetella pertussis*, Coronavirus, Influenza A H1, Influenza A H3, Influenza A H1-2009, Influenza B, *Mycoplasma pneumoniae*, and Parainfluenza Virus were established primarily with retrospective clinical specimens. Performance characteristics for *Chlamydomphila pneumoniae* were established primarily using contrived clinical specimens.

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Performance characteristics for Influenza A were established when Influenza A H1-2009, A H1, and A H3 were the predominant Influenza A viruses in circulation. Performance of detecting Influenza A may vary if other Influenza A strains are circulating or a novel Influenza A virus emerges. If infection with a novel Influenza A virus is suspected based on current clinical and epidemiological screening criteria recommended by public health authorities, specimens should be collected with appropriate infection control precautions for novel virulent Influenza viruses and sent to state or local health departments for testing. Viral culture should not be attempted in these cases unless a BSL 3+ facility is available to receive and culture specimens.

Device Description:

The FilmArray Respiratory Panel EZ (RP EZ) is a multiplex nucleic acid test designed to be used with the FilmArray 2.0 EZ Configuration instrument. The FilmArray RP pouch (a component of the FilmArray RP EZ test system) contains freeze-dried reagents to perform nucleic acid purification, reverse transcription, and nested, multiplex PCR with DNA melt analysis. FilmArray RP EZ simultaneously conducts 14 tests for the identification of respiratory pathogens from nasopharyngeal swabs (NPS) obtained from individuals suspected of respiratory tract infections (Table 1). Results from the FilmArray RP EZ test are available within about one hour.

Table 1. Pathogens Detected by the FilmArray RP EZ

Viral Targets Detected	Bacterial Targets Detected
Adenovirus Coronavirus	<i>Bordetella pertussis</i> <i>Chlamydomphila pneumoniae</i>

Human Metapneumovirus Human Rhinovirus/Enterovirus Influenza A, including subtypes H1, H3 and H1-2009 Influenza B Parainfluenza Virus Respiratory Syncytial Virus	<i>Mycoplasma pneumoniae</i>
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A test is initiated by loading Hydration Solution and an unprocessed patient nasopharyngeal swab (NPS) specimen (i.e. specimen mixed with Sample Buffer) into the FilmArray RP pouch. The pouch contains all of the reagents required for specimen testing and analysis in a freeze-dried format; the addition of Hydration Solution and specimen/Sample Buffer Mix rehydrates the reagents. After the pouch is prepared, the FilmArray software guides the user through the steps of placing the pouch into the instrument, scanning the pouch barcode, entering the sample identification, and initiating the run.

The FilmArray instrument contains a coordinated system of inflatable bladders and seal points, which act on the pouch to control the movement of liquid between the pouch blisters. When a bladder is inflated over a reagent blister, it forces liquid from the blister into connecting channels. Alternatively, when a seal is placed over a connecting channel it acts as a valve to open or close a channel. In addition, electronically controlled pneumatic pistons are positioned over multiple plungers in order to deliver the rehydrated reagents into the blisters at the appropriate times. Two Peltier devices control heating and cooling of the pouch to drive the PCR reactions and the melt curve analysis.

Nucleic acid extraction occurs within the FilmArray RPPouch using mechanical and chemical lysis followed by purification using standard magnetic bead technology. After extracting and purifying nucleic acids from the unprocessed sample, the FilmArray performs a nested multiplex PCR that is executed in two stages. During the first stage, the FilmArray performs a single, large volume, highly multiplexed reverse transcription PCR (rt-PCR) reaction. The products from first stage PCR are then diluted and combined with a fresh, primer-free master mix and a fluorescent double stranded DNA binding dye (LCGreen[®] Plus, BioFire Defense, LLC). The solution is then distributed to each well of the array. Array wells contain sets of primers designed specifically to amplify sequences internal to the PCR products generated during the first stage PCR reaction. The 2nd stage PCR, or nested PCR, is performed in singleplex fashion in each well of the array. At the conclusion of the 2nd stage PCR, the array is interrogated by melt curve analysis for the detection of signature amplicons denoting the presence of specific targets. A digital camera placed in front of the array captures fluorescent images of the PCR reactions and software interprets the data.

The FilmArray software automatically interprets the results of each DNA melt curve analysis and combines the data with the results of the internal pouch controls to provide a test result for each organism on the panel.

Substantial Equivalence:

The FilmArray Respiratory Panel EZ is substantially equivalent to the FilmArray Respiratory Panel for use with FilmArray 2.0 and FilmArray Injection Vials (K143080), which was cleared on February 17, 2015 and determined to be a Class II device.

The following table compares the FilmArray Respiratory Panel EZ to the previously cleared FilmArray Respiratory Panel for use with FilmArray System 2.0 and FilmArray Injection Vials (K143080). The table outlines the similarities and differences between the two systems.

Table 2. Comparison of the FilmArray Respiratory Panel EZ to the FilmArray Respiratory Panel for use with FilmArray System 2.0 and FilmArray Injection Vials.

Element	New Device: FilmArray Respiratory Panel EZ (for use with FilmArray 2.0 EZ Configuration)	Predicate: FilmArray Respiratory Panel for use with FilmArray System 2.0 and FilmArray Injection Vials (K143080)
Organisms Detected	Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype 2009 H1, Influenza B, Respiratory Syncytial Virus, Human Metapneumovirus, Adenovirus, Parainfluenza, Human Rhinovirus/Enterovirus, Coronavirus, <i>Mycoplasma pneumoniae</i> , <i>Chlamydophila pneumoniae</i> , and <i>Bordetella pertussis</i> .	Influenza A, Influenza A subtype H1, Influenza A subtype H3, Influenza A subtype 2009 H1, Influenza B, Respiratory Syncytial Virus, Human Metapneumovirus, Adenovirus, Parainfluenza 1, Parainfluenza 2, Parainfluenza virus 3, Parainfluenza 4, Human Rhinovirus/Enterovirus, Coronavirus HKU1, Coronavirus NL63, Coronavirus 229E, Coronavirus OC43, <i>Mycoplasma pneumoniae</i> , <i>Chlamydophila pneumoniae</i> , and <i>Bordetella pertussis</i> .
Analyte	RNA/DNA	Same
Specimen Types	Nasopharyngeal swabs	Same
Technological Principles	Nested multiplex RT-PCR followed by high resolution melting analysis to confirm identity of amplified product.	Same
Instrumentation	FilmArray 2.0 EZ Configuration	FilmArray or FilmArray 2.0
Time to result	About 1 hour	Same
Test Interpretation	Automated test interpretation and report generation. User cannot access raw data (melt analysis data and individual assay results)	Same User can access raw data (melt analysis data and individual assay results)
Reagent Hydration and Sample Loading	FilmArray Injection Vial-based loading procedure.	Same
Sample Preparation Method	Sample Processing is automated in the FilmArray RP pouch.	Same
Reagent Storage	Reagents are stored at room temperature.	Same
Controls	Two controls are included in each reagent pouch to control for sample processing and both stages of PCR and melt analysis.	Same

Element	New Device: FilmArray Respiratory Panel EZ (for use with FilmArray 2.0 EZ Configuration)	Predicate: FilmArray Respiratory Panel for use with FilmArray System 2.0 and FilmArray Injection Vials (K143080)
User Complexity	Low	Moderate

Summary of Supporting Data:

Previous Clinical and Analytical Studies

The FilmArray RP reagent pouch and the FilmArray 2.0 instrument (both of which are components of the FilmArray RP EZ system) remain unchanged. Clinical and Analytical performance data have been provided in previous 510(k) submissions (K103175, K110764, K120267, K123620, K143080).

Verification and Validation (V&V) of Software Modifications:

The FilmArray EZ software was modified from the FilmArray 2.0 software by removing the multi-instrument dashboard and ability to run multiple instruments, removing PCR evaluator, and simplifying the user interface. In addition, the FilmArray RP EZ pouch module was modified from the FilmArray RP pouch module in order to simplify the results report format and also to combine all four Parainfluenza Virus subtypes into a single Parainfluenza Virus result and all four Coronavirus subtypes into a single Coronavirus result. Verification and Validation activities comprising automated and manual test cases confirmed that the FilmArray EZ software and the FilmArray RP EZ pouch module function as intended when used together in the FilmArray RP EZ test system.

External Control Material:

BioFire recommends the use of an external control panel manufactured by Maine Molecular Quality Controls, Inc., Scarborough, ME (online at www.mmqci.com) to be used with the FilmArray RP EZ:

FilmArray RP EZ Control Panel M265, Part number M265
(Also available as BioFire Diagnostics Part Number CHEM-CTL-0001)

- 6 vials of RP EZ Positive M266, Part number M266
- 6 vials of RP EZ Negative M267, Part number M267

The panel is comprised of six individual ready-to-use vials of a positive control material (containing all FilmArray RP EZ analytes) and six individual ready-to-use vials of a negative control material (containing no analytes). This external control panel should be tested when receiving a new shipment of test pouches and when training a new user.

A study was performed to assess the ability of the intended user to perform external control testing using the recommended control material and testing procedure for the FilmArray Respiratory Panel (RP) EZ in a CLIA-waived setting. The primary metric evaluated by this study was the ability of these users to acquire and accurately interpret FilmArray RP EZ results when testing the provided external control material. The RP EZ test was performed according to the manufacturer's instructions by users with training and educational backgrounds consistent with those in the CLIA-waived testing environment (i.e. the intended users). User training on use of the FilmArray RP EZ was limited to the training video and quick guide provided with the EZ system.

Testing consisted of three positive and three negative controls run per day, and spanned a period of 10 days (total of 60 control runs per site). Multiple operators participated in testing at each of the three locations. Three lots each of external control material and three lots of RP EZ pouches were tested across all sites.

A total of 182 external controls were tested (91 positive and 91 negative) by RP EZ users. Two tests were excluded from final data analysis due to invalid results caused by internal pouch control failures. Data for the remaining 180 control tests are shown below in Table 1.

Table 1. Summary of RP EZ external control test results

Site	Positive	Negative	Total
Site 1	30/30 (100%)	28/30 (93.3%)	58/60 (96.7%)
Site 2	30/30 (100%)	30/30 (100%)	60/60 (100%)
Site 3	30/30 (100%)	30/30 (100%)	60/60 (100%)
Total	90/90 (100%)	88/90 (97.8%)	178/180 (98.9%)

Overall, the users acquired correct control test results in 98.9% of the controls tested, indicating that intended users can accurately perform external control testing in the intended use setting.

Conclusion:

The fundamental scientific technology of the FilmArray RP reagent pouch and FilmArray 2.0 instrument remain unchanged components of the new FilmArray RP EZ system. Data presented demonstrate that the FilmArray RP EZ for use with the FilmArray 2.0 EZ Configuration, which contain modifications to increase simplicity of test use, is substantially equivalent to the FilmArray RP for use with the FilmArray 2.0 system.