NOV 2 1 2013 K 132066

510(k) Summary of Safety and Effectiveness

1. **Sponsor**

Rapid Pathogen Screening, Inc.
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Sarasota, FL 34240
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2. **Date Prepared**

November 20, 2013

3. **Device Information**

Proprietary Name:	InflammaDry™
Common Name:	Dry eye test
Product Code	PFQ
Regulations:	21CFR 862.1540
Classification:	Class I, exempt, meets limitations of exemptions per 862.9 (c) (9)
Panel:	Chemistry (75)

Proprietary Name:	InflammaDry™ External Controls
Common Name:	Quality controls
Regulations:	21CFR 862.1660
Classification:	Class I, reserved
Panel:	Chemistry (75)

4. **Predicate Device**

For InflammaDry:
OcuSense, Inc., TearLab™ Osmolarity System (K083184)

For InflammaDry External Controls:
Predicate name: TearLab Control Solutions (K083184)

5. Device Description

Components-
InflammaDry™ consists of three (3) parts: a sterile Sample Collector, an immunoassay test strip in a plastic Test Cassette housing, and Buffer in a vial. The Sample Collector is used to take a sample of human tears. The separately packaged and sterile Sample Collector has a contoured end with a Dacron fleece to collect the tear sample from the inside of the lower eyelid. The plastic housing of the Test Cassette body protects the strip from unintended physical influence. Additionally, the housing guarantees correct sample transfer onto the lateral flow assay strip. The Buffer vial contains a buffered salt solution containing proteins, detergents and preservatives. The Buffer functions as the solution that initiates the test, carries antigen through a microfiltration process to remove unwanted cellular debris, and transports the immune complex and the control conjugate to the Test and Control Lines on the test strip membrane.

InflammaDry External Controls are to be used with the InflammaDry test only and are intended to verify that the test reagents are working and that the test is performed correctly. Both Negative and Positive external controls for InflammaDry™ are supplied as lyophilized powder in small glass vials with screw caps. 200 µl of recombinant MMP-9 in Stabilizing buffer solution is quickly frozen and lyophilized under vacuum. A soft and pliable plastic dropper bottle filled with a DI water diluent is provided with each set of external controls. The InflammaDry external controls are sold as a separate catalog item.

Mechanism of action –
The InflammaDry™ test is based on the principle of lateral flow immunoassays using Direct Sampling Micro-Filtration technology. Matrix metalloproteinase-9 (MMP-9) present in the tear fluid is captured between two (2) highly specific anti-MMP-9 antibodies: a monoclonal mouse anti-MMP-9 antibody and a polyclonal goat anti-human antibody. This antigen-antibody complex is captured at an immobilized Test Line. The formation of a blue color line at the control zone line with a red color line at the test zone line is considered as a positive result, a blue color line at the control zone only is considered as a negative result, if a blue color line in the control zone does not appear the test is considered invalid.

The test is a disposable, rapid test requiring 10-15 minutes for a result.

6. Intended Use

InflammaDry is a rapid, immunoassay test for the visual, qualitative *in vitro* detection of elevated levels of the MMP-9 protein in human tears from patients suspected of having dry eye to aid in the diagnosis of dry eye in conjunction with other methods of clinical evaluation. This test is intended for prescription use at point-of-care sites.

InflammaDry External Controls are QC materials used for verifying the performance of the InflammaDry test reagents and assay. These controls can also be used to assist in operator training and troubleshoot invalid results.

7. Substantial Equivalence

The InflammaDry test has similar Indications For Use to the predicate, TearLab Osmolarity System, in that they are indicated for the evaluation of human tears for assessing dry eye. The subject device and the predicate device are made from materials which have demonstrated satisfactory biocompatibility and are single use devices. Controls are available for both tests. Any technology differences between the InflammaDry test and the predicate do not raise any new questions of safety or effectiveness. Performance data demonstrate that the InflammaDry test is at least as safe and effective as the predicate device. In conclusion, the InflammaDry test is substantially equivalent to other legally marketed tear collection and measurement device(s).

Table 1.: InflammaDry™ and TearLab Osmolarity System Predicate Device Comparison Chart

	InflammaDry	**TearLab Osmolarity System** (K083184) Includes Control Solutions
Manufacturer	Rapid Pathogen Screening, Inc.	OcuSense, Inc.
Indications	InflammaDry is a rapid, immunoassay test for the visual, qualitative *in vitro* detection of elevated levels of the MMP-9 protein in human tears from patients suspected of having dry eye to aid in the diagnosis of dry eye in conjunction with other methods of clinical evaluation.	The TearLab Osmolarity System is intended to measure the osmolarity of human tears to aid in the diagnosis of patients with signs or symptoms of dry eye disease, in conjunction with other methods of clinical evaluation.

Materials	Plastic housings, membrane, glass fiber absorbent tip and waste pad, foil pouches, MMP-9 antibody gold conjugate, dacron fleece and buffer solution. Phenol red dye added to the Sample Collector dacron fleece.	The device consists of the following components and accessories: One TearLab Reader, Two TearLab Pens, Two TearLab Electronic Check Cards, Single Use TearLab Osmolarity Test cards, and TearLab Control Solutions.
Product Code	PFQ	OND, JJX
Rx / OTC	Rx	Rx
Sterile	Yes, Sample Collector by gamma radiation	No; test cards are hygienically clean.
Kit Composition	Sample Collector and Test Cassette sealed in foil pouches and a vial of buffer	The device consists of the following components and accessories: One TearLab Reader, Two TearLab Pens, Two TearLab Electronic Check Cards, Single Use TearLab Osmolarity Test cards, and TearLab Control Solutions.
Technology	Lateral Flow Immunoassay	The TearLab Osmolarity Test utilizes an impedance measurement of tear fluid to provide a calculated measurement of osmolarity.
Antigen Detected	Matrix Metalloproteinase 9 (MMP-9)	Not applicable
Duration of Contact	< 1 minute	Seconds
Limit of Detection	> 40 ng/ml	275 – 400 mOsms/L
Test Line Color (after	Red	NA
Control Line Color (after result)	Blue	NA
Bench Testing	Yes, Bench Testing Performed	Yes
Animal Testing	Not Applicable	No
CLIA Status	Not waived	CLIA Waived

Mechanism Of Action	The InflammaDry test is based on the principle of lateral flow immunoassay using Direct Sampling Micro-Filtration technology. Matrix Metalloproteinase 9 (MMP-9) present in the tear is captured between a monoclonal anti- MMP-9 antibody conjugated to colloidal gold and biotinylated polyclonal anti- MMP-9. This antigen-antibody complex is captured by NeutrAvidin immobilized as the Test Line. The test is a disposable, rapid test requiring 10-15 minutes for a result.	The TearLab Osmolarity Test utilizes a temperature-corrected impedance measurement to provide an indirect assessment of osmolarity. After applying a lot-specific calibration curve, osmolarity is calculated and displayed as a quantitative numerical value.
Specimen Types	Human tears	Human tears
Biological derived	Contains antibodies	NA
Site preparation	None	None.
External Controls: Form	Lyophilized	Liquid
Function / purpose	Verify performance of InflammaDry test reagents and assay; assist with operator training; troubleshoot invalid results.	Monitor day-to-day test variation; lot-to-lot test kit performance; Assist with operator training; Trouble shoot invalid results.
Test Results	Qualitative	Quantitative

8. Performance Testing

In vitro Testing –
The InflammaDry test completed a series of analytical bench tests for sensitivity and specificity.

Analytical Performance Studies –

Precision studies

Precision studies were performed at three point-of-care sites using stabilizing buffer spiked to the following concentrations: negative (zero), cutoff, +/-25%, and +/-50%, of the cutoff. The samples were aliquoted, randomized and blinded, then given to each site. A total of 120 determinations were made at each concentration. Testing was performed in duplicate twice a day over 5 days by 6 intended use operators (2/site). The intended users performed the testing by following the instructions for use. Sample concentrations were confirmed by LC/MS/MS.

		Negative	-50%	-25%	Cutoff	+25%	+50%
		Neg/Pos	Neg/Pos	Neg/Pos	Neg/Pos	Neg/Pos	Neg/Pos
Site 1	Op 1	20/0	19/1	18/2	4/16	0/20	0/20
	Op 2	20/0	19/1	10/10	4/16	2/18	0/20
Site 2	Op 1	20/0	20/0	17/3	10/10	3/17	0/20
	Op 2	20/0	20/0	18/2	12/8	2/18	3/17
Site 3	Op 1	20/0	20/0	19/1	10/10	2/18	0/20
	Op 2	20/0	20/0	18/2	12/8	2/18	0/20
Combined		120/0	118/2	100/20	52/68	11/109	3/117

Determining the C50 Concentration
A series of MMP-9 antigen concentrations in tear fluid was tested in replicates of ten to determine the C_{50} (or cutoff) for the InflammaDry. Ten independent Readers scored the presence or absence of test lines for each test. The results of all Readers were summed and the frequency of positive results was determined to obtain the concentrations closest to C_{50}(+/- 3%) Concentration.

A concentration of 40 ng/mL of MMP-9 was the lowest concentration tested that met the definition of C_{50}. This concentration produced a positive result 52% of the time. The closest concentration tested that did not meet the acceptance criteria was 35 ng/mL which produced a positive result 34% of the time.

Interfering Substances

The effect of different eye drops on the analytical sensitivity and specificity of the InflammaDry ™ tests was determined. The eye drops were evaluated with two different MMP-9 antigen concentrations, C_5 (C_{50} – 25%) and C_{95} (C_{50} + 25%) in duplicate. Influence of the relevant proteins on sensitivity and specificity is also examined. Any positive or negative interfering substance identified by this testing was re-tested using C_{50} – 50%, and C_{50} +50%.

The following eye medications were tested for interference in human teares at the cutoff level and the respective medication. The following medications did not show any interferences:

Alcaine Alcon, "Azopt"-Alcon, Econopred Alcon, "Nevanac"-Alcon, "Pataday"-Alcon, Systaine"-Alcon, Tobra Dex, "Travatan"-Alcon, Alcon, Vigamox Alcon, "Acular LS"-Allergan, Alphagan Allergan, "Combigan"-Allergan, Elastat Allergan, "FML"-Allergan Lastacaft –Allergan, Lumigan Allergan, Optive"-Allergan, Pred Forte"-Allergan, Refresh Liquigel, Refreash Tears Allergan, Zymar Allergan, "Blink Tears"-Amo, Thera Tears AVS, Alrex B&L, Lotemax B&L, Zylet"-Bausch&Lomb, Gentamycin Sulfate-Falcon, Polymyxin B sulfate Falcon, "Timolol"-Falcon, "AzaSite"-Inspire, Bepreve-Ista, "Xibrom"-Ista, Optivar MedPDEnte, Truspot Merck, GenTeal"-Novartis, "Voltaren"-Novartis, "Zaditor"-Novartis, Visine Pfizer, Xalatan Pharmacia, human IgA (1 mg/ml), Sigma-Aldrich, human lactoferrin (1 mg/ml), Sigma-Aldrich, Transferrin (1 mg/ml), Betimol Vistakon

However, the following medications show false positive or false negative results: Vistakon, Iquix; Vistakon, Quixin; Wilson, Proparacaine; and Trusopt.

Therefore, sponsor has the following limitations in the labeling:

Patients should not be tested with InflammaDry if the following medications were administrated into the eyes within 2 hours of the testing of the ImflammaDry. Interferences medications: Vistakon, Iquix; Vistakon, Quixin; Wilson, Proparacaine; and Trusopt.

Certain medications such as systemic immunodulators, topical or oral steroids, cyclosporine, tetracycline and topical azithromycin are known to inhibit metalloproteinase activity. Use of these medications may lead to false negative results.

Cross Reactivity

The cross-reactivity of the test was evaluated with microorganism culture and biomarkers that might be found in tear fluid. The cross-reactants included:

Adenovirus	1500 TCID50
IgE	250 ng/ml
MMP-1	150 ng/ml
MMP-2	150 ng/ml
MMP-3	150 ng/ml
Tissue Inhibitor of MMP-1	150 ng/ml
Tissue Inhibitor of MMP-2	150 ng/ml

No cross reactivity was observed with either the organism or any of the biomarkers evaluated.

External Controls:

Three (3) different Stability Studies were conducted with the InflammaDry External Controls:

1. An Accelerated Stability Study was performed on the lyophilized external control vials at 45°C. The study indicates that there is no loss of activity at an extrapolated shelf life of two years.

2. A stability study was performed on the InflammaDry reconstituted external controls. The reconstituted external controls showed no loss of activity at 25°C for one week.

3. A Real Time Stability Study was performed on the InflammaDry External Controls. The study was performed on the lyophilized external control vials and indicated that there was no loss of activity at 27 months.

Biocompatibility is supported by literature references.

Animal Studies – Not Applicable.

Clinical Studies

The InflammaDry Test underwent a clinical evaluation to determine the negative and positive agreement of the InflammaDry with clinical assessment of dry eye. The study design was a prospective, sequential, masked, clinical trial. Those patients who were clinically determined by an ophthalmic clinician to meet enrollment criteria were included in the study. The study enrolled 237 patients consisting of 164 females and 73 males between the ages of 18 and 94 years old with an average age of 53 years. Patients presented from both private practices

and academic centers from various regions across the country. Although 257 patients were recruited, seventeen (17) patients were excluded for a protocol deviation.

The protocol deviation involved patients receiving topical ocular anesthetic prior to the evaluation of the tear break up time (TBUT) and corneal staining, potentially accelerating the TBUT and inducing corneal staining.

Inclusion Criteria

- 18 years of age or older
- Patient voluntarily reported at least 1 episode of any of the following ocular symptoms during the last month:

    1. Burning or stinging
    2. Sandy or gritty feeling
    3. Foreign body sensation
    4. Tearing
    5. Light sensitivity
    6. Intermittent or fluctuating vision
    7. Tired eyes

Exclusion Criteria

- Allergy to cornstarch or Dacron
- Allergy to topical anesthetic or fluorescein dye
- Prior eye injury, trauma, or ocular surgery within the last 3 months
- Known blockage of the lacrimal drainage system
- Contact lens wear in the last month
- Previous corneal refractive surgery including RK, LASIK or PRK surgery
- Have an active ocular infection or history of a recent ocular infection in the last month
- Have active intraocular inflammation or history of intraocular inflammation, e.g. Uveitis
- Use of oral doxycycline, corticosteroids, or immunomodulators in the last month
- Have received topical ocular corticosteroids, topical Nonsteroidal (NSAIDs) therapy, or topical ocular cyclosporine in the last month
- Pregnant or lactating
- Use of any topical ophthalmic medications, including artificial tears 2 hours prior to enrollment

Study testing was done on the subject's more symptomatic eye (if no difference existed symptomatically between the two eyes, the right eye was tested). Each subject underwent

the following sequence of testing: Each patient had the following tests performed: InflammaDry, tear break up time (TBUT), Schirmer tear testing, and corneal staining.

The InflammaDry was compared to the clinical assessment in the table below. Derived from the DEWS criteria, the clinical assessment was developed to represent a combination of symptoms and signs. The pivotal clinical trial used the same metrics for TBUT, Schirmer tear testing, and corneal staining as described in the DEWS criteria, however, conjunctival injection, conjunctival staining, and the presence of meibomian disease were not tested or used to characterize the severity of dry eye disease. In general, the worst severity for any sign tested determined the overall severity. Symptoms are known to be poorly correlated with signs with even the most severe dry eye patients often reporting little to no symptoms. Patients were categorized to the highest severity level at which all required criteria are satisfied. Patients who do not meet all the required clinical criteria for a given severity grade will be considered to be at the next lower grade.

Clinical Testing	**Negative Control**	**Mild Grade 1**	**Moderate Grade 2**	**Moderately Severe Grade 3**	**Severe Grade 4**
OSDI score	≤13	≥ 13	≥ 13	≥ 13	≥ 13
TBUT (sec)[8]	> 10	< 10	≤10	≤ 5	0 (immediate)
Schirmer (mm/5 min)[8]	>10	< 10	≤10	≤ 5	≤2
Staining (0-5)[9]	None	None	1-2	3	≥ 4

Clinical Results

Site 1	Grade					Total
	4	3	2	1	0	
InflammaDry +	0	0	15	41	1	57
InflammaDry –	0	0	0	2	31	33
Total	0	0	15	43	32	90

Site 2	Grade					Total
	4	3	2	1	0	
InflammaDry +	0	7	21	1	1	30
InflammaDry –	0	0	0	7	47	55
Total		7	21	9	48	85

Site 3	Grade					Total
	4	3	2	1	0	
InflammaDry +	0	0	4	4	0	8
InflammaDry –	0	0	3	1	0	4
Total	0	0	7	5	0	12

Site 4	Grade					Total
	4	3	2	1	0	
InflammaDry +	1	11	20	1	0	33
InflammaDry –	0	2	13	2	0	17
Total	1	13	33	3	0	50

Grade is assessed based on OSDI, TBUT, Schirmer tear testing, and corneal staining as described in the DEWS criteria, however, conjunctival injection, conjunctival staining, and the presence of meibomian disease were not tested or used to characterize the severity of dry eye disease.

- Grade 0 (Negative Control)is when OSDSI is ≤13, TBUT is >10 seconds, Schirmer is >10mm, Staining is none
- Grade 1 (Mild) is when OSDI score is ≥ 13, TBUT is <10 seconds, Schirmer test is <10 mm, Staining is none

- Grade 2 (Moderate) is when OSDSI is ≥13, TBUT is ≤10 seconds, Schirmer is ≤10 mm, Staining is 1-2
- Grade 3 (Moderately Severe) is when OSDSI is ≥13, TBUT is <5 seconds, Schirmer is ≤5 mm, Staining is 3
- Grade 4 (Severe) is when OSDSI is ≥13, TBUT is 0 seconds (immediate), Schirmer is ≤2 mm, Staining is ≥4

Device Performance:

The multicenter clinical study depicted below demonstrated the following range of performance: Positive Agreement 66%-97% and Negative Agreement 97%-98%. At 2 sites Negative Agreement could not be calculated because there were no subjects without dry eye.

N = 237			Clinical Assessment OSDI** + TBUT + Schirmer + Staining		Positive % agreement 95% confidence interval	Negative % agreement 95% confidence interval
			Positive	Negative		
Site 1	InflammaDry	Positive	56	1	97% (56/58) (88%, 99%)	97% (31/32) (84%, 99%)
		Negative	2	31		
Site 2	InflammaDry	Positive	29	1	76% (29/37) (62%, 90%)	98% (47/48) (89%, 100%)
		Negative	8	47		
Site 3	InflammaDry	Positive	8	0	67% (8/12) (39%, 86%)	N/A*
		Negative	4	0		
Site 4	InflammaDry	Positive	33	0	66% (33/50) (51%, 79%)	N/A*
		Negative	17	0		

*N/A = not available. Negative Agreement cannot be calculated because there were no subjects without dry eye.

*** 11 patients were assessed to be positive for mild dry eye based on the OSDI (OSDI ≥ 13) without any associated positive objective test results*

9. Conclusion

Rapid Pathogen Screening, Inc. believes that, as a result of the bench testing, clinical testing and supporting biocompatibility information, InflammaDry™ is safe and effective for use in the detection of Dry Eye disease. InflammaDry is substantially equivalent to the predicate device, TearLab™ Osmolarity System (K083184).

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
10903 New Hampshire Avenue
Document Control Center – WO66-G609
Silver Spring, MD 20993-0002

November 21, 2013

RAPID PATHOGEN SCREENING, INC.
DOUGLAS BUESCHEL
VP, QUALITY ASSURANCE AND REGULATORY AFFAIRS
7227 DELAINEY COURT
SARASOTA FL 34240

Re: K132066
Trade/Device Name: InflammaDry and InflammaDry External Controls
Regulation Number: 21 CFR 862.1540
Regulation Name: Osmolality test system
Regulatory Class: I exempt, meets limitations of exemptions, 21 CFR 862.9 (b) and (c) (9)
Product Code: PFQ, JJX
Dated: November 19, 2013
Received: November 20, 2013

Dear Mr. Bueschel:

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 Small Manufacturers, International and Consumer Assistance 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" (21CFR 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 Small Manufacturers, International and Consumer Assistance 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,

Carol C. Benson -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

Indications for Use

510(k) Number (if known): **K132066**

Device Name: **InflammaDry™, InflammaDry™ External Controls**

Indications for Use:

InflammaDry is a rapid, immunoassay test for the visual, qualitative *in vitro* detection of elevated levels of the MMP-9 protein in human tears from patients suspected of having dry eye to aid in the diagnosis of dry eye in conjunction with other methods of clinical evaluation. This test is intended for prescription use at point-of-care sites.

InflammaDry External Controls are QC materials used for verifying the performance of the InflammaDry test reagents and assay. These controls can also be used to assist in operator training and troubleshoot invalid results.

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

(PLEASE DO NOT WRITE BELOW THIS LINE-CONTINUE ON ANOTHER PAGE OF NEEDED)

Concurrence of CDRH, Office of In Vitro Devices and Radiologic Health (OIR)

Yung-Chan -S

Division Sign-Off
Office of In Vitro Device and Radiologic Health

510(k) k132066