510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY
DEVICE ONLY TEMPLATE

A. 510(k) Number:
4K032166

B. Analyte:
Respiratory Syncytial virus

C. Type of Test:
Immunochromatographic membrane assay

D. Applicant:
Binax Inc.

E. Proprietary and Established Names:
BINAX NOW® RSV Test

F. Regulatory Information:

1. Regulation section:
   866.3480
2. Classification:
   I
3. Product Code:
   GQG
4. Panel:
   Microbiology (83)

G. Intended Use:

1. Intended use(s):

The Binax NOW® RSV Test is a rapid immunochromatographic assay for the qualitative detection of respiratory syncytial virus (RSV) fusion protein antigen in nasal wash and nasopharyngeal swab specimens from symptomatic patients. This test is intended for *in vitro* diagnostic use to aid in the diagnosis of respiratory syncytial virus infections in neonatal and pediatric patients under the age of five. It is recommended that negative test results be confirmed by cell culture.

2. Indication(s) for use:
   NA
3. Special condition for use statement(s):
   NA
4. Special instrument Requirements:
   NA

H. Device Description:

The Binax NOW® RSV Test is an immunochromatographic membrane assay used to detect RSV fusion protein antigen in nasal wash and nasopharyngeal swab specimens. Anti-RSV antibody, the Sample Line, is adsorbed onto nitrocellulose membrane. Control antibody is adsorbed onto the same membrane as a second stripe. Both anti-RSV and control antibodies are conjugated to visualizing particles that are dried onto an inert fibrous support. The resulting conjugate pad and the striped membrane are combined to

construct the test strip. This test strip is mounted on the right side of a cardboard, book-shaped hinged test device.

Swab samples (controls and patients) require a preparation step, in which the sample is eluted off the swab into an appropriate solution. Nasal wash samples do not require any preparation.

To perform the test, the sample to be tested is added to the white pad at the top of the test strip, and the test device is closed. RSV antigen present in the sample reacts to bind anti-RSV conjugated antibody. The resulting antigen-conjugate complexes are captured by immobilized anti-RSV antibody, forming the Sample Line. Immobilized Control Line antibody captures a visualizing conjugate, forming a pink Control Line. The Control Line is blue in a device that has not been tested.

Test results are interpreted by the presence or absence of visually detectable pink-to-purple colored lines. A positive test result, read at 15 minutes, will include the detection of both a Sample Line and a Control Line. A negative test result, read at 15 minutes, will produce only a Control Line, indicating that RSV antigen was not detected in the sample. Failure of the Control Line to appear, or the Control Line remaining blue, indicates an invalid assay, whether the Sample Line is present or not.

The device is provided in kit form, the contents are as follows.

Test Devices: A membrane coated with mouse antibody specific for RSV antigen and with control line antibody is combined with mouse anti-RSV and control line antibody conjugates in a hinged test device. The membrane of an untested device contains a blue line at the control line area.

Transfer Pipettes: Fixed volume (100 µl) transfer pipettes used to transfer sample to the test devices. Use only pipettes provided by Binax or a calibrated pipette capable of delivering 100 µl sample volume.

Positive Control Swab: Inactivated RSV dried onto swab.

Negative Control Swab: Inactivated Streptococcus Group A dried onto swab.

Elution Ampoules for Control Swabs: Ampoules containing a fixed volume (0.5 ml) of elution solution used to prepare the Control Swabs for testing.

Test Vials for Control Swabs: Vials with screw caps used to prepare the Control Swabs for testing.

I. Substantial Equivalence Information:

1. Predicate device name(s):
   BD Directigen ™ EZ RSV
2. Predicate K number(s):
   K022133

3. Comparison with predicate:

Parameter	NOW® Test		Directigen™ EZ RSV 510(k) #K022133
ANALYTE	RSV antigen		Same
DETECTION SYSTEM	Immunochromatographic Membrane Assay		Same
TEST MATRIX	Nasopharyngeal specimens		Same
INTENDED USE	Detection of RSV antigen in nasopharyngeal specimens		Same
ANALYTICAL SENSITIVITY	1.56×10^{-1} to 5.00×10^{4} $TCID_{50}$/ml for 6 RSV A and 5 RSV B strains.		4.05×10^{2} to 5.95×10^{3} $TCID_{50}$/ml for 2 RSV A and 3 RSV B strains.
ANALYTICAL SPECIFICITY	Does not cross-react with the 28 bacteria and 20 viruses tested at relevant concentrations in the Binax test.		Does not cross-react with the 58 bacteria, 2 yeasts and 39 viruses tested at relevant concentrations in the BD test.
INTERFERING SUBSTANCES	Does not cross-react with 2% whole blood or the 17 OTC and prescription medications tested. Palivisumab may interfere with Binax NOW® Test detection of RSV.		Does not cross-react with 2% whole blood or the 25 OTC and prescription medications tested, inlcuding Palivisumab.
REPRODUCIBILITY	Reproducibility testing conducted at 3 test sites produced an overall test reproducibility of 100%.		Reproducibility testing conducted at 3 test sites produced an overall test reproducibility of 99.1%.
NASAL WASH PERFORMANCE			
	Prospective	**Retrospective**	**Prospective**
SENSITIVITY (95% CI)	Insufficient data for claim	89% (77.3-95.3)	87% (80.1-90.1)
SPECIFICITY (95% CI)	98% (95.4-99.4)	100% (75.3-99.8)	86% (80.1-90.1)
NASOPHARYNGEAL SWAB PERFORMANCE			
	Prospective		**Prospective**
SENSITIVITY (95% CI)	92% (75.7-97.6)		67% (47.2-82.7)
SPECIFICITY (95% CI)	95% (90.6-97.5)		92% (88.2-95.2)

J. Standard/Guidance Document Referenced (if applicable):

NA

K. Test Principle:

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L. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Precision/Reproducibility:

A blind study of the Binax NOW® test was conducted at 3 separate sites using a panel of coded specimens containing negative, low positive (LOD), and low/moderate positive controls. Participants performed testing on 3 different days. One hundred percent (100%) of the 234 samples tested were correctly interpreted.

b. Linearity/assay reportable range:

NA

c. Traceability (controls, calibrators, or method):

NA

d. Detection limit:

The LOD level of inactivated RSV, detected 95% of the time, is 93.7 μg/swab.

RSV μg/swab	Number Detected	% Detection
Negative	0/20	0%
48.4	13/19*	68%
56.7	32/40	80%
67.0	35/38*	92%
80.3	37/40	93%
93.7	38/40	95%

*Three invalid tests were reported, including 1 @ 48.4 μg/swab and 2 @ 67.0 μg/swab

e. Analytical specificity:

To demonstrate the immunologic specificity of the Binax NOW® test, 48 potential cross-reactants were tested in the Binax NOW® test. The cross-reactant panel included bacteria and viruses that may be present in respiratory specimens. Bacteria tested at concentrations greater than 1×10^8 organisms/ml and viruses tested at concentrations greater than 1×10^5 $TCID_{50}$/ml did not cross-react in the Binax NOW® Test. Metapneumovirus was tested at a concentration of 2×10^3 $TCID_{50}$/ml and did not cross-react.

f. Assay cut-off:

NA

2. Comparison studies:
    a. *Method comparison with predicate device:*
    NA
    b. *Matrix comparison:*
    NA
3. Clinical studies:
    a. *Clinical sensitivity:*

CLINICAL STUDIES

Nasal Wash - Specificity (Prospective Study):

The performance of the Binax RSV test on nasal wash specimens was compared to cell culture in a multi-center study conducted during the 2002 Flu season at physician offices and clinics located throughout the United States. Nasal wash specimens were collected from children and adults presenting with RSV-like symptoms for 3 days or less and evaluated in the Binax test. The population tested was approximately 46% female and 54% male. Patients were not included in the study if they had received an influenza vaccine within 6 months of the enrollment period, or if they had taken either an influenza or RSV medication within 30 days of the enrollment period. There were no invalid tests reported.

One hundred ninety-one (191) nasal wash specimens were tested at 4 different test sites. Binax NOW® test overall specificity was 98%, and overall test agreement was 98%. Ninety-five percent (95%) confidence intervals are listed below.

		Nasal Wash Viral Culture +	Nasal Wash Viral Culture -
NOW®	+	3	3
Result	-	1	184

				95% CI
Sensitivity	=	89%	(42/47)	(77.3% - 95.3%)
Specificity	=	98%	(184/187)	(95.4% - 99.4%)
Overall Agreement	=	98%	(187/191)	(94.7% - 99.1%)

The Binax NOW® test performed similarly at the 4 test sites as shown in the table below.

	POSITIVE POINTS	**SPECIFICITY**		
	NOW®/CULTURE	**NOW®/CULTURE**	**%**	**95% CI**
Site I	1/1	91/94	97	91.1-98.8
Site II	2/3	83/83	100	95.7-100
Site III	0/0	6/6	100	59.0-99.6
Site IV	0/0	4/4	100	47.8-99.5

Nasal Wash - Sensitivity and Specificity (Retrospective Study):

Since there were a low number of positive culture confirmed RSV infections generated during the prospective study using nasal wash specimens, a retrospective study was conducted as follows. Nasal wash specimens from 47 viral culture positive RSV patients and 12 viral culture negative RSV patients were evaluated in the Binax NOW® test. All of the samples were obtained from a large university medical center and had been collected from patients living in the northeastern region of the US. The population tested was approximately 49% male and 51% female.

NOW® test sensitivity was 89%, while test specificity was 100%. Overall test agreement was 92%. Ninety-five percent (95%) confidence intervals are listed below.

		Nasal Wash Viral Culture +	Nasal Wash Viral Culture -
NOW®	+	42	0
Result	-	5	12

				95% CI
Sensitivity	=	89%	(42/47)	(77.3% - 95.3%)
Specificity	=	100%	(12/12)	(75.3% - 99.8%)
Overall Agreement	=	92%	(54/59)	(81.6% - 96.2%)

Nasopharyngeal Swab - Sensitivity and Specificity (Prospective Study):

The performance of the Binax RSV test on nasopharyngeal swab specimens was compared to cell culture/DFA in a multi-center US study conducted during the 2002 and2003 Flu seasons. Nasopharyngeal swab specimens were collected from children presenting with RSV- or flu-like symptoms. All swab samples were placed in 0.5-3 mls of viral transport media prior to evaluation in the Binax test. The population tested was 43% female and 57% male.

One hundred and seventy-nine (179) nasopharyngeal swab specimens were tested. There were no invalid tests reported. Binax NOW® test sensitivity, specificity and overall agreement as compared to culture/DFA were 93%. Ninety-five percent (95%) confidence intervals are listed below.

		Nasopharyngeal Swab Culture / DFA +	Nasopharyngeal Swab Culture / DFA -
NOW®	+	25	10
Result	-	2	142

			95% CI
Sensitivity	= 93%	(25/27)	(76.5% - 97.7%)
Specificity	= 93%	(142/152)	(88.3% - 96.4%)
Overall Agreement	= 93%	(167/179)	(88.6%-96.1%)

The Binax NOW® test performed similarly at all test sites as shown in the tables below.

SENSITIVITY

Site	#	%	95% CI
1	14/15	93	69.8-98.4
2	9/10	90	58.7-97.7
3	0/0	NA	NA
4	2/2	100	29.2-99.2

SPECIFICITY

Site	#	%	95% CI
1	69/74	93	85.1-97.0
2	20/23	87	67.6-95.3
3	16/18	89	66.9-96.6
4	37/37	100	90.7-99.9

b. Clinical specificity:
see a.

c. Other clinical supportive data (when a and b are not applicable):

4. Clinical cut-off:
   NA
5. Expected values/Reference range:
   NA

M. Conclusion:

The assay should be considered SE; labeling is appropriate and has been reviewed.