510(k) Summary
for
Bio-Rad Laboratories, Inc.
BioPlex™ 2200 ToRC IgG

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1. APPLICANT/SPONSOR

Bio-Rad Laboratories, Inc.
BioPlex Division
5500 East Second Street
Benicia, CA 94510

Contact Person: Teresa Peterson
Telephone: 510-741-5702
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2. DEVICE NAME

Proprietary Name: BioPlex™ 2200 ToRC IgG Kit
BioPlex™ 2200 ToRC IgG Calibrator Set
BioPlex™ 2200 ToRC IgG Control Set

Common/Usual Name: Multi-Analyte Detection System for *Toxoplasma gondii* IgG, Rubella IgG and Cytomegalovirus (CMV) IgG

Classification Name: *Toxoplasma gondii* serological reagents
Rubella virus serological reagents
Cytomegalovirus serological reagents
Calibrator, multi-analyte mixture
Multi-analyte controls, all kinds (assayed and unassayed)

3. PREDICATE DEVICES

- bioMeriéux VIDAS® TOXO IgG II K993319
- bioMeriéux VIDAS® Rubella IgG K902925
- bioMeriéux VIDAS® CMV IgG K920661

4. DEVICE DESCRIPTION

The BioPlex™ 2200 ToRC IgG kit uses multiplex flow immunoassay, a methodology that greatly resembles traditional EIA, but permits simultaneous detection and identification of many antibodies in a single tube. "ToRC" is an acronym for individual tests to detect antibodies to *Toxoplasma gondii* (*T. gondii*), Rubella, and Cytomegalovirus (CMV). Three (3) different populations of dyed beads are coated with cell lysates bearing *T. gondii*, Rubella, or CMV antigens.

The BioPlex 2200 System combines an aliquot of patient sample, sample diluent, and bead reagent into a reaction vessel; the mixture is incubated at 37°C. After a wash cycle, anti-human IgG antibody, conjugated to phycoerythrin (PE), is added to the dyed beads, and this mixture is incubated at 37°C. The excess conjugate is removed in another wash cycle, and the beads are re-suspended in wash buffer. The bead mixture then passes through the detector. The identity of the dyed beads is determined by the fluorescence of the dyes, and the amount of antibody captured by the antigen is determined by the fluorescence of the attached PE. Raw data are calculated in relative fluorescence intensity (RFI).

Three additional dyed beads, Internal Standard Bead (ISB), Serum Verification Bead (SVB) and a Reagent Blank Bead (RBB) are present in each reaction mixture to verify detector response, the addition of serum or plasma to the reaction vessel and the absence of significant non-specific binding in serum or plasma.

The instrument is calibrated using a set of six (6) distinct calibrator vials, the BioPlex 2200 ToRC IgG Calibrator Set. For *T. gondii* and Rubella, six (6) vials, representing six (6) different levels of antibody concentrations, are used for quantitative calibration, and results for patient samples are expressed in IU/mL. For *T. gondii*, results of ≤ 9 IU/mL are negative, 10 and 11 IU/mL are equivocal, and results of ≥ 12 IU/mL are reported as positive. For Rubella, results of ≤ 7 IU/mL are reported as negative, 8 and 9 IU/mL are equivocal, and ≥ 10 IU/mL are reported as positive. For CMV, four (4) vials, representing four (4) different antibody concentrations, are used for qualitative calibration. CMV results are expressed as an antibody index (AI) and results of ≤ 0.8 AI are negative, 0.9 and 1.0 AI are equivocal, and results of ≥ 1.1 AI are reported as positive.

The BioPlex 2200 ToRC IgG Control Set includes a negative control as well as two (2) multi-analyte positive controls. The BioPlex ToRC IgG Low Positive Control contains antibodies for *T. gondii*, Rubella and CMV and the BioPlex ToRC IgG High Positive Control contains antibodies for *T. gondii* and Rubella. The BioPlex ToRC IgG Positive Controls are manufactured to give positive results, with values above the cut-off for each specific analyte. The BioPlex ToRC IgG Negative Control is manufactured to give negative results, with values below the cut-off for each specific analyte. The recommended frequency for performing quality control is once every 24-hour testing

period. Performing quality control is also necessary after each new assay calibration and certain service procedures.

BioPlex™ 2200 ToRC IgG Kit Components

The BioPlex 2200 ToRC IgG kit (665-1650) contains supplies sufficient for 100 tests.

Vial	Description
Bead Set	One (1) 10 mL vial containing three (3) different populations of dyed beads coated with lysates (tachyzoites, Vero cell and nuclear) of *T. gondii*, Rubella and CMV; plus an Internal Standard Bead (ISB), a Serum Verification Bead (SVB) and a Reagent Blank Bead (RBB); with protein stabilizers (bovine) in a saline buffer. ProClin® 300 (0.3%), sodium benzoate (0.1%) and sodium azide (<0.1%) as preservatives.
Conjugate	One (1) 5 mL vial, containing murine monoclonal anti-human IgG/phycoerythrin conjugate, in a phosphate buffer. ProClin® 300 (0.3%), sodium benzoate (0.1%) and sodium azide (<0.1%) as preservatives.
Sample Diluent	One (1) 10 mL vial, containing protein stabilizers (bovine and murine) in a saline buffer. ProClin® 300 (0.3%), sodium benzoate (0.1%) and sodium azide (<0.1%) as preservatives.

Additional Required Items, Available from Bio-Rad:

Catalog #	Description
663-1600	BioPlex 2200 ToRC IgG Calibrator Set: Six (6) 0.5 mL vials containing antibodies to *T. gondii*, Rubella and CMV derived from human disease state plasma, in a human serum matrix made from defibrinated plasma. ProClin® 300 (0.3%), sodium benzoate (0.1%) and sodium azide (<0.1%) as preservatives.
663-1630	BioPlex 2200 ToRC IgG Control Set: Two (2) 1.5 mL vials of Low Positive Control containing antibodies to *T. gondii*, Rubella and CMV; two (2) 1.5 mL vials of High Positive Control containing antibodies to *T. gondii* and Rubella; and two (2) 1.5 mL vials of Negative Control Serum. All controls in a human serum matrix made from defibrinated plasma, with ProClin® 300 (0.3%), sodium benzoate (0.1%) and sodium azide (<0.1%) as preservatives. All antibodies are derived from human disease state plasma.
660-0817	BioPlex 2200 Sheath Fluid: Two (2) 4 L bottles containing Phosphate Buffered Saline (PBS). ProClin® 300 (0.03%) and sodium azide (<0.1%) as preservatives.
660-0818	BioPlex 2200 Wash Solution: One (1) 10 L bottle containing Phosphate Buffered Saline (PBS) and Tween 20. ProClin® 300 (0.03%) and sodium azide (<0.1%) as preservatives.
660-0000	BioPlex 2200 Instrument and Software System.

5. INTENDED USE

BioPlex™ 2200 ToRC IgG Kit

The BioPlex™ 2200 ToRC IgG kit is a multiplex flow immunoassay intended for the quantitative detection of IgG antibodies to *Toxoplasma gondii* (*T. gondii*) and Rubella, and the qualitative detection of IgG antibodies to Cytomegalovirus (CMV) in human serum and EDTA or heparinized plasma.

The ToRC IgG kit is intended for use with the Bio-Rad BioPlex 2200 System.

This kit is intended as an aid in the determination of serological status to *T. gondii*, Rubella and CMV. This kit is not intended for use in screening blood or plasma donors.

Performance characteristics for *T. gondii* and Rubella have not been evaluated in immunocompromised or immunosuppressed individuals. Performance characteristics for CMV have not been evaluated in immunosuppressed or organ transplant individuals. Performance characteristics of this kit have not been established for use in neonatal screening or for use at a point of care.

BioPlex™ 2200 ToRC IgG Calibrator Set

The BioPlex 2200 ToRC IgG Calibrator Set is intended for the calibration of the BioPlex 2200 ToRC IgG Reagent Pack.

BioPlex™ 2200 ToRC IgG Control Set

The BioPlex 2200 ToRC IgG Control Set is intended for use as an assayed quality control to monitor the overall performance of the BioPlex 2200 Instrument and BioPlex ToRC IgG Reagent Pack in the clinical laboratory. The performance of the BioPlex 2200 ToRC IgG Control Set has not been established with any other *Toxoplasma gondii*, Rubella or Cytomegalovirus (CMV) IgG antibody assays.

6. TECHNOLOGICAL CHARACTERISTICS AND SUBSTANTIAL EQUIVALENCE

The following tables summarize the similarities and differences between the BioPlex 2200 ToRC IgG kit and the predicate devices used in comparative studies with the BioPlex 2200 ToRC IgG kit.

BioPlex™ 2200 ToRC IgG Kit vs. Predicate Devices - Similarities

Item	BioPlex™ 2200 ToRC IgG Kit	bioMerieux, Inc. VIDAS® TOXO IgG II (K993319)	bioMerieux, Inc. VIDAS® Rubella IgG (K902925)	bioMerieux, Inc. VIDAS® CMV IgG (K920661)
Intended Use	- The BioPlex™ 2200 ToRC IgG kit is a multiplex flow immunoassay intended for the quantitative detection of IgG antibodies to *Toxoplasma gondii* (*T. gondii*) and Rubella, and the qualitative detection of IgG antibodies to Cytomegalovirus (CMV) in human serum and EDTA or heparinized plasma. - The ToRC IgG kit is intended for use with the Bio-Rad BioPlex 2200 System. - This kit is intended as an aid in the determination of serological status to *T. gondii*, Rubella and CMV. This kit is not intended for use in the screening of blood or plasma donors.	VIDAS® Toxo IgG II (TXG) is an automated quantitative test for use on the VIDAS analyzer for the measurement of anti-Toxoplasma IgG in human serum using the ELFA technique. It is intended for use as an aid in determination of immune status.	VIDAS® Rubella IgG (RBG) assay is intended for use with a VIDAS (Vitek ImmunoDiagnostic Assay System) instrument as an automated qualitative enzyme-linked fluorescent immunoassay (ELFA) for the detection of IgG antibodies to rubella virus in human serum.	VIDAS® Cytomegalovirus IgG (CMVG) is intended for use with the VIDAS (Vitek ImmunoDiagnostic Assay System) instrument as a semi-quantitative automated enzyme-linked fluorescent immunoassay (ELFA)for the detection of IgG antibodies to Cytomegalovirus in human serum.
Antigen	Partially purified cell lysates of *T. gondii*, Rubella, and CMV	Membrane and cytotoxic Toxoplasma antigen (RH Sabin Strain)	Inactivated Rubella virus (HPV-77)	Purified and inactivated CMV antigen (Strain AD 169)
Assay Type	Quantitative detection for *T. gondii*, Rubella, and qualitative for CMV	Same		
Analyte Detected	Human IgG antibodies to *T. gondii*, Rubella, and CMV	Same		
Signal Detection	Fluorescence	Same		

BioPlex 2200 ToRC IgG Kit vs. Predicate Devices - Differences

Item	BioPlex™ 2200 ToRC IgG Kit	bioMerieux, Inc. VIDAS® TOXO IgG II (K993319)	bioMerieux, Inc. VIDAS® Rubella IgG (K902925)	bioMerieux, Inc. VIDAS® CMV IgG (K920661)
Number of Analytes Simultaneously Detected	Multiple (3)	Single		
Enzyme Conjugate	Phycoerythrin conjugated	Horseradish peroxidase conjugated		
Matrices	Serum and plasma (EDTA and heparin)	Serum		
Assay Technology	Multiplex flow immunoassay	Two-step enzyme immunoassay sandwich method with fluorescent detection (ELFA)		
Solid Phase	Antigen-coated paramagnetic microbead reagent. Microbeads are infused with red and infrared fluorescent dyes for bead classification. Green fluorescence from the immunoassay label is used for analyte measurement.	Antigen-coated solid phase receptacles		
Calibrator(s)	Multiple Calibrators	Single Calibrator		
Controls	Negative Control and multi-analyte Positive Controls	Negative Control and Positive Control specific for *T. gondii*	Negative Control and Positive Control specific for rubella virus	Negative Control and Positive Control specific for CMV virus

7. PERFORMANCE TESTING

A series of studies was conducted to evaluate the performance of the BioPlex™ 2200 ToRC IgG kit. The studies included reproducibility, linearity, interfering substances, cross-reactivity, correlation with CDC evaluation panels, expected values and performance characteristics. The results of all studies demonstrated that the BioPlex 2200 ToRC IgG kit performed according to its specifications.

A. Reproducibility

Separate internal and external reproducibility studies were conducted to evaluate the reproducibility of the BioPlex 2200 ToRC IgG kit on the BioPlex 2200 instrument. Reproducibility studies were based on the principles described in Clinical and Laboratory Standards Institute (CLSI) EP5-A2, *Evaluation of Precision Performance of Quantitative Measurement Methods.*

For the internal reproducibility study, three (3) panels made from serum and plasma (EDTA and heparinized) were assayed two (2) times in two (2) separate daily runs over 20 days (n=80). The data were analyzed for within-run, between-run, between-day, and total precision and the standard deviation (SD) and percent coefficient of variation (% CV) were calculated. The within-run precision for positive samples, greater than their respective cut-offs, in all sample matrices ranged from 3.9% to 9.5% for *T. gondii* IgG, 3.0% to 5.0% for Rubella IgG, and 1.8% to 5.6% for CMV IgG. The total precision for positive samples, greater than their respective cut-offs, in all sample matrices ranged from 6.6% to 12.3% for *T. gondii* IgG, 5.2% to 9.9% for Rubella IgG, and 3.8% to 8.7% for CMV IgG.

An external reproducibility study was performed at each of three (3) U.S. testing facilities. Three (3) panels made from serum and plasma (EDTA and heparinized) were assayed two (2) times on two (2) separate daily runs over five (5) days at the three (3) sites (N=60). The data were analyzed for within-run, between-run, between-day, between-site, and total precision and the standard deviation (SD) and percent coefficient of variation (% CV) were calculated. The within-run precision for positive samples, greater than their respective cut-offs, in all sample matrices ranged from 3.7% to 7.7% for *T. gondii* IgG, 4.6% to 6.6% for Rubella IgG, and 2.5% to 5.8% for CMV IgG. The total precision for positive samples, greater than their respective cut-offs, in all sample matrices ranged from 4.8% to 17.6% for *T. gondii* IgG, 7.2% to 10.3% for Rubella IgG and 4.4% to 12.1% for CMV IgG.

An additional external Rubella reproducibility study was performed at each of three (3) U.S. testing facilities. A panel of three (3) Rubella IgG samples measuring near cut-off was assayed in replicates of 40 in one run at each

site. The data were analyzed for within-run precision and the standard deviation (SD) and percent coefficient of variation (% CV) were calculated. The within-run precision ranged from 5.2% to 9.7%.

B. Linearity

Linearity of the BioPlex 2200 ToRC IgG kit was determined based on the principles described in Clinical and Laboratory Standards Institute (CLSI) EP6-A, *Evaluation of the Linearity of Quantitative Measurement Procedures: Statistical Approach*. The assay ranges are *T. gondii* (3 – 900 IU/mL), Rubella (1 – 250 IU/mL) and CMV (0.2 – 8.0 AI), and were established by examining the clinical relevance of reporting high value results and the ability of the calibration curve to discriminate sample dilutions. Five (5) high positive serum samples were obtained for each analyte in the kit. The samples were selected at the high end of the assay range and serial dilutions prepared using negative serum. Linear and polynomial regression analysis of IU/mL or AI vs. sample dilution was performed to determine if the dilution curves exhibit statistically significant non-linear regression. The results demonstrated acceptable dilution linearity, as all recoveries were within ±20% of the predicted value.

Linearity of BioPlex ToRC IgG *T. gondii* and Rubella assays was evaluated using World Health Organization (WHO) IgG standards. Dilutions of anti-Toxoplasma serum, 3rd International Standard (TOXM), and anti-Rubella immunoglobulin, 1st International Standard (RUBI-1-94), were prepared and tested in the respective assay. Results obtained demonstrated acceptable dilution linearity through the cut-off, as all recoveries were within ±20% of the predicted value.

C. Interfering Substances

An interfering substances study was conducted to evaluate the potential interference of specific endogenous and exogenous substances with the BioPlex 2200 ToRC IgG assays. The study was conducted based on the principles described in Clinical and Laboratory Standards Institute (CLSI) EP7-A2, *Interference Testing in Clinical Chemistry*. No significant interference was observed with any of the substances tested. The substances and the maximum levels tested are shown in the table below.

Interfering Substances

Substance	Concentration
Hemoglobin	500 mg/dL
Bilirubin, Unconjugated	30 mg/dL
Bilirubin, Conjugated	30 mg/dL
Cholesterol	500 mg/dL
Red Blood Cells	0.4% (v/v)
Gamma Globulin	6 g/dL
Triglyceride	3500 mg/dL
Total Protein (albumin)	12 g/dL
Ascorbic Acid	3 mg/dL
Heparin Lithium	8000 units/dL
Heparin Sodium	8000 units/dL
EDTA	800 mg/dL

D. Cross-Reactivity

A cross-reactivity study was performed to determine if samples from various disease states and other potentially interfering factors interfere with test results when tested with the BioPlex 2200 ToRC IgG kit. A panel of ten (10) specimens positive for each cross reactant were evaluated for possible cross-reactivity with each of the three (3) BioPlex ToRC IgG assays. Samples were also tested with reference ToRC IgG assays. The results demonstrated that the various disease state samples evaluated do not cross-react with the three (3) assays in the BioPlex ToRC IgG kit. Most of the samples evaluated were high positives for each disease state. If a specific disease state did cross react to the various assays of the BioPlex ToRC IgG kit, all samples for that particular disease would elicit a positive response. The majority of the samples that elicited a positive result were also confirmed positive by the corresponding reference ToRC IgG assay. Results are shown in the table below.

Cross-Reactivity

Potential Cross-Reactant	N	Method	Number of Positive and Discordant Determinations		
			T. gondii IgG	Rubella IgG	CMV IgG
ANA IgG	10	BioPlex 2200	4	9	8*
		Reference	4	10	8
		Discordant	0	1	0
CMV IgG	10	BioPlex 2200	2	9	10
		Reference	2	9	10
		Discordant	0	0	0
dsDNA (SLE clinical)	10	BioPlex 2200	4	9	9
		Reference	4*	9	9
		Discordant	0	0	0
EBV VCA IgG	10	BioPlex 2200	1	9	3
		Reference	1	9	3
		Discordant	0	0	0
hCG (pregnancy)	10	BioPlex 2200	4	9	10
		Reference	4	9	10
		Discordant	0	0	0
HIV IgG	10	BioPlex 2200	1	9	10
		Reference	1	9	10
		Discordant	0	0	0
HSV-1 IgG	10	BioPlex 2200	0	10	7
		Reference	0	10	6*
		Discordant	0	0	0
HSV-2 IgG	10	BioPlex 2200	3	10	8*
		Reference	3	10	9
		Discordant	0	0	0
Influenza IgG	10	BioPlex 2200	5	7	7
		Reference	5	7	7
		Discordant	0	0	0
Mumps IgG	10	BioPlex 2200	4	10	7
		Reference	4	10	7
		Discordant	0	0	0
Myeloma IgG	10	BioPlex 2200	3	7	9
		Reference	3	8	7
		Discordant	0	1	2
Parvovirus B19 IgG	10	BioPlex 2200	2	10	4
		Reference	2	10	5
		Discordant	0	0	1
Rheumatoid Factor IgM	10	BioPlex 2200	1	10	9
		Reference	1	10	9
		Discordant	0	0	0
Rubella IgG	10	BioPlex 2200	3	10	7
		Reference	3	10	7
		Discordant	0	0	0
Rubeola (measles) IgG	10	BioPlex 2200	0	10	5
		Reference	0	10	5
		Discordant	0	0	0
T. gondii IgG	10	BioPlex 2200	9	9	9
		Reference	9	9	9
		Discordant	0	0	0
VZV IgG	10	BioPlex 2200	3*	10	7
		Reference	3*	10	7
		Discordant	0	0	0

**One equivocal result was not included in the count and was not considered as a false positive or negative discrepant.*

E. Correlation with CDC Evaluation Panels

A correlation study was performed to evaluate the characteristics of the BioPlex ToRC IgG kit with serum panels provided by the Centers for Disease Control (CDC) for *T. gondii*, Rubella and CMV. Three (3) panels were tested and the data were provided to the CDC for comparison against the CDC Reference Methods for the three (3) analytes. The results are presented in the tables below.

Characteristics of CDC *T. gondii* Reference Sera (N=100)

CDC Samples	Reference Result	BioPlex Pos (+)	BioPlex Neg (-)
T. gondii IgG	Pos (+)	70	0
	Neg (-)	0	30

Characteristics of CDC Rubella Reference Sera (N=100)

CDC Samples	Reference Result	Site 1		Site 2		Site 3	
		BioPlex Pos (+)	BioPlex Neg (-)	BioPlex Pos (+)	BioPlex Neg (-)	BioPlex Pos (+)	BioPlex Neg (-)
Rubella IgG	Pos (+)	82	0	82	0	82	0
	Neg (-)	0	18	0	18	0	18

Characteristics of CDC CMV Reference Sera (N=100)

CDC Samples	Reference Result	BioPlex Pos (+)	BioPlex Neg (-)
CMV IgG	Pos (+)	66	0
	Neg (-)	0	34

F. Expected Values/Prevalence

The observed prevalence for each of the ToRC IgG assays, individually and in dual infection, was determined using samples collected from pregnant women in the U.S. and Europe as well as in clinical samples submitted for *T. gondii*, Rubella, or CMV IgG testing. For *T. gondii*, results of ≤ 9 IU/mL are negative, 10 and 11 IU/mL are equivocal, and results of ≥ 12 IU/mL are reported as positive. For Rubella, results of ≤ 7 IU/mL are reported as negative, 8 and 9 IU/mL are equivocal, and ≥ 10 IU/mL are reported as positive. For CMV, results of ≤ 0.8 AI are negative, 0.9 and 1.0 AI are equivocal, and ≥ 1.1 AI are reported as positive. Results from all sites are shown and summarized in the tables below.

Prevalence of Individual Assay Positive in Pregnant Women

Age	*T. gondii* IgG US		*T. gondii* IgG Europe		Rubella IgG		CMV IgG	
	Pos/Total	% Prevalence	Pos/Total	% Prevalence	Pos/Total	% Prevalence	Pos/Total	% Prevalence
16-25	5/42	11.9	9/31	29.0	71/73	97.3	41/73	56.2
26-35	5/89	5.6	33/83	39.8	155/172	90.1	90/172	52.3
36-45	1/19	5.3	16/36	44.4	50/55	90.9	28/55	50.9
Total	11/150	7.3	58/150	38.7	276/300	92.0	159/300	53.0

Note: There was 1 equivocal result for T. gondii and 6 equivocal results for Rubella

Prevalence of Dual Assay Positive in Pregnant Women

Age	*T. gondii* IgG / Rubella IgG US		*T. gondii* IgG / Rubella IgG Europe		*T. gondii* IgG / CMV IgG US		*T. gondii* IgG / CMV IgG Europe		Rubella IgG / CMV IgG	
	Pos/Total	% Prevalence	Pos/Total	% Prevalence	Pos/Total	% Prevalence	Pos/Total	% Prevalence	Pos/Total	% Prevalence
16-25	5/42	11.9	9/31	29.0	2/42	4.8	4/31	12.9	39/73	53.4
26-35	4/89	4.5	31/83	37.3	2/89	2.2	19/83	22.9	79/172	45.9
36-45	1/19	5.3	16/36	44.4	1/19	5.3	6/36	16.7	25/55	45.5
Total	10/150	6.7	56/150	37.3	5/150	3.3	29/150	19.3	143/300	47.7

Prevalence of Individual Assay Positive in Samples Submitted for ToRC IgG Testing

Age	Gender	*T. gondii* IgG		Rubella IgG		CMV IgG	
		Pos/Total	% Prevalence	Pos/Total	% Prevalence	Pos/Total	% Prevalence
1-10	Female	1/9	11.1	8/9	88.9	3/9	33.3
	Male	1/8	12.5	7/8	87.5	0/8	0.0
11-20	Female	2/63	3.2	54/63	85.7	34/63	54.0
	Male	1/31	3.2	28/31	90.3	16/31	51.6
21-30	Female	30/232	12.9	214/232	92.2	123/232	53.0
	Male	6/56	10.7	50/56	89.3	33/56	58.9
31-40	Female	31/250	12.4	222/250	88.8	125/250	50.0
	Male	19/83	22.9	63/83	75.9	54/83	65.1
41-50	Female	8/86	9.3	78/86	90.7	60/86	69.8
	Male	16/96	16.7	78/96	81.3	64/96	66.7
51-60	Female	5/57	8.8	54/57	94.7	37/57	64.9
	Male	26/99	26.3	91/99	91.9	62/99	62.6
61-70	Female	12/44	27.3	38/44	86.4	36/44	81.8
	Male	15/50	30.0	49/50	98.0	35/50	70.0
71+	Female	8/12	66.7	12/12	100.0	12/12	100.0
	Male	5/14	35.7	12/14	85.7	10/14	71.4
Unknown Age and/or Gender		1/10	10.0	8/10	80.0	6/10	60.0
Total		187/1200	15.6	1066/1200	88.8	710/1200	59.2

Note: There were 5 equivocal results for T. gondii, 31 equivocal results for Rubella, and 1 equivocal result for CMV.

Prevalence of Dual Assay Positive in Samples Submitted for ToRC IgG Testing

Age	Gender	*T.gondii* IgG/ Rubella IgG		*T.gondii* IgG/ CMV IgG		Rubella IgG /CMV IgG	
		Pos/Total	% Prevalence	Pos/Total	% Prevalence	Pos/Total	% Prevalence
1-10	Female	1/9	11.1	0/9	0.0	2/9	22.2
	Male	1/8	12.5	0/8	0.0	0/8	0.0
11-20	Female	2/63	3.2	2/63	3.2	28/63	44.4
	Male	1/31	3.2	1/31	3.2	14/31	45.2
21-30	Female	29/232	12.5	24/232	10.3	120/232	51.7
	Male	5/56	8.9	3/56	5.4	31/56	55.4
31-40	Female	30/250	12.0	17/250	6.8	115/250	46.0
	Male	15/83	18.1	13/83	15.7	43/83	51.8
41-50	Female	8/86	9.3	6/86	7.0	54/86	62.8
	Male	14/96	14.6	12/96	12.5	52/96	54.2
51-60	Female	5/57	8.8	4/57	7.0	35/57	61.4
	Male	24/99	24.2	15/99	15.2	57/99	57.6
61-70	Female	12/44	27.3	12/44	27.3	30/44	68.2
	Male	15/50	30.0	11/50	22.0	34/50	68.0
71+	Female	8/12	66.7	8/12	66.7	12/12	100.0
	Male	5/14	35.7	5/14	35.7	9/14	64.3
Unknown Age and/or Gender		1/10	10.0	1/10	10.0	4/10	40.0
Total		176/1200	14.7	134/1200	11.2	640/1200	53.3

Prevalence of CMV in Immunocompromised/AIDS Patient Samples Submitted for CMV IgG Testing

Age	Gender	CMV IgG	
		Pos/Total	% Prevalence
1-10	Female	0/0	0.0
	Male	1/1	100
11-20	Female	4/8	50.0
	Male	2/6	33.3
21-30	Female	2/2	100
	Male	5/5	100
31-40	Female	10/10	100
	Male	12/14	85.7
41-50	Female	8/8	100
	Male	21/23	91.3
51-60	Female	3/4	75.0
	Male	10/11	90.9
61-70	Female	4/4	100
	Male	4/4	100
71+	Female	0/0	0.0
	Male	0/0	0.0
Total		86/100	86.0

G. Performance Characteristics

Prospective Study: Performance of the ToRC IgG kit was evaluated against corresponding commercially available *T. gondii*, Rubella, and CMV immunoassays. U.S. clinical sites tested a combined: 300 prospective samples from pregnant women (150 U.S. and 150 Europe), 1200 prospective samples submitted for *T. gondii*, Rubella, and/or CMV IgG testing, and 100 prospective samples from immunocompromised/AIDS patients submitted for CMV testing. Results from all sites are shown and summarized in the tables below.

BioPlex Rubella IgG vs. EIA: Prospective

Antibody/Population				Predicate Rubella IgG Assay			BioPlex 2200 Agreement Excluding Equivocal Results				BioPlex 2200 Agreement Including Equivocal Results			
				Pos (+)	Neg (-)	Equivocal	Pos (+) % Agreement	95% Confidence Interval	Neg (-) % Agreement	95% Confidence Interval	Pos (+) % Agreement	95% Confidence Interval	Neg (-) % Agreement	95% Confidence Interval
BioPlex 2200 ToRC IgG	Rubella IgG	Pregnant Women (N = 300)	Pos (+)	276	0	0	97.2% (276/284)	94.5-98.6%	100% (8/8)	67.6-100%	94.5% (276/292)	91.3-96.6%	100% (8/8)	67.6-100%
			Neg (-)	8	8	2								
			Equivocal	6	0	0								
			Total	290	8	2								
		Clinical Samples Submitted for Testing (N = 400)	Pos (+)	358	0	1	96.5% (358/371)	94.1-97.9%	100% (12/12)	75.8-100%	92.7% (358/386)	89.7-94.9%	85.7% (12/14)	61.1-96.0%
			Neg (-)	13	12	3								
			Equivocal	12	1	0								
			Total	383	13	4								

*Due to the low prevalence of Rubella IgG negative samples, a retrospective study also was conducted.

BioPlex T. gondii IgG vs. EIA: Prospective

Antibody/Population				Predicate *T. gondii* IgG Assay			BioPlex 2200 Agreement			
				Pos (+)	Neg (-)	Equivocal	Pos (+) % Agreement	95% Confidence Interval	Neg (-) % Agreement	95% Confidence Interval
BioPlex 2200 ToRC	*T. gondii* IgG	Total (N = 700)	Pos (+)	118	0	6	97.5% (118/121)	93.0-99.2%	98.8% (569/576)	97.5-99.4%
			Neg (-)	1	569	1				
			Equivocal	1	1	3				
			Total	120	570	10				

BioPlex CMV IgG vs. EIA: Prospective

Antibody/Population				Predicate CMV IgG Assay			BioPlex 2200 Agreement			
				Pos (+)	Neg (-)	Equivocal	Pos (+) % Agreement	95% Confidence Interval	Neg (-) % Agreement	95% Confidence Interval
BioPlex 2200 ToRC IgG	CMV IgG	Total (N = 700)	Pos (+)	394	2	2	99.0% (394/398)	97.4-99.6%	98.7% (298/302)	96.6-99.5%
			Neg (-)	4	298	0				
			Equivocal	0	0	0				
			Total	398	300	2				
		HIV+ (N = 100)	Pos (+)	86	0	0	100% (86/86)	95.8-100%	100% (14/14)	76.8-100%
			Neg (-)	0	14	0				
			Equivocal	0	0	0				
			Total	86	14	0				

Retrospective Study: Performance of the ToRC IgG kit was evaluated using samples with confirmed known Rubella IgG status against a commercially available Rubella IgG immunoassay. Rubella IgG status was determined in clinical laboratories using an FDA-cleared assay for Rubella IgG. Two (2) U.S. clinical sites tested a combined: 50 Rubella IgG low positive samples (10-20 IU/mL), 50 Rubella IgG high positive samples (> 20 IU/mL) and 130 Rubella IgG negative samples (< 10 IU/mL). All samples were preselected based on the assay result falling in the ranges described. Results are shown in the table below.

BioPlex Rubella IgG vs. EIA: Retrospective

Preselected Samples		Predicate Rubella IgG Assay			BioPlex 2200 Agreement Excluding Equivocal Results				BioPlex 2200 Agreement Including Equivocal Results			
		Pos (+)	Neg (-)	Equivocal	Pos (+) % Agreement	95% Confidence Interval	Neg (-) % Agreement	95% Confidence Interval	Pos (+) % Agreement	95% Confidence Interval	Neg (-) % Agreement	95% Confidence Interval
BioPlex 2200 ToRC IgG Rubella IgG	Pos (+)	90	0	1	92.8% (90/97)	85.8-96.5%	100% (124/124)	97.0-100%	86.5%* (90/104)	78.7-91.8%	99.2% (124/125)	95.6-99.9%
	Neg (-)	7	124	2								
	Equivocal	5	0	1								
	Total	102	124	4								

*Most of the discordant samples were low positive or close to the cut-off for the predicate assay.

DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
2098 Gaither Road
Rockville MD 20850

Cynthia Sinclair, RAC
Principal Consultant, Regulatory Services
Medical Device Consultants, Inc.
49 Plain Street
North Attleboro, MA 02760

FEB 23 2009

Re: K080008
Trade/Device Name: BioPlex™ 2200 ToRC IgG
Regulation Number: 21 CFR 866.3510
Regulation Name: Rubella virus serological reagents
Regulatory Class: Class II
Product Code: OMI, JIX, JJY
Dated: February 18, 2009
Received: February 19, 2009

Dear Ms. Sinclair:

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); and good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820).
This letter will allow you to begin marketing your device as described in your Section 510(k) premarket notification. The FDA finding of substantial equivalence of your

This letter will allow you to begin marketing your device as described in your Section 510(k) premarket notification. The FDA finding of substantial equivalence of your device to a legally marketed predicate device results in a classification for your device and thus, permits your device to proceed to the market.

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 240-276-0450. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21CFR 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 240-276-3474. For questions regarding the reporting of device adverse events (Medical Device Reporting (MDR)), please contact the Division of Surveillance Systems at 240-276-3464. 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 (240) 276-3150 or at its Internet address http://www.fda.gov/cdrh/industry/support/index.html.

Sincerely yours,

Sally A. Hojvat, M.Sc., Ph.D.
Director
Division of Microbiology Devices
Office of *In Vitro* Diagnostic Device
Evaluation and Safety
Center for Devices and
Radiological Health

Enclosure

Indications for Use

510(k) Number (if known): K080008

Device Name: BioPlex™ 2200 System ToRC IgG Kit on the BioPlex™ 2200 Multi-Analyte Detection System
BioPlex™ 2200 ToRC IgG Calibrator Set
BioPlex™ 2200 ToRC IgG Control Set

Indications for Use:

BioPlex™ 2200 ToRC IgG Kit

The BioPlex 2200 ToRC IgG kit is a multiplex flow immunoassay intended for the quantitative detection of IgG antibodies to *Toxoplasma gondii* (*T. gondii*) and Rubella, and the qualitative detection of IgG antibodies to Cytomegalovirus (CMV) in human serum and EDTA or heparinized plasma.

The ToRC IgG kit is intended for use with the Bio-Rad BioPlex 2200 System.

This kit is intended as an aid in the determination of serological status to *T. gondii*, Rubella and CMV. This kit is not intended for use in screening blood or plasma donors.

Performance characteristics for *T. gondii* and Rubella have not been evaluated in immunocompromised or immunosuppressed individuals. Performance characteristics for CMV have not been evaluated in immunosuppressed or organ transplant individuals. Performance characteristics of this kit have not been established for use in neonatal screening or for use at a point of care.

BioPlex™ 2200 ToRC IgG Calibrator Set

The BioPlex 2200 ToRC IgG Calibrator Set is intended for the calibration of the BioPlex 2200 ToRC IgG Reagent Pack.

BioPlex™ 2200 ToRC IgG Control Set

The BioPlex 2200 ToRC IgG Control Set is intended for use as an assayed quality control to monitor the overall performance of the BioPlex 2200 Instrument and BioPlex ToRG IgG Reagent Pack in the clinical laboratory. The performance of the BioPlex 2200 ToRC IgG Control Set has not been established with any other *Toxoplasma gondii*, Rubella or Cytomegalovirus (CMV) IgG antibody assays.

Prescription Use ___X___ (21 CFR Part 801 Subpart D)	And/Or	Over the Counter Use _____ (21 CFR Part 801 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) k080008