510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION
DECISION SUMMARY

A. 510(k) Number:

K143236

B. Purpose for Submission:

New device

C. Measurand:

HSV-1 specific IgG antibodies

D. Type of Test:

Chemiluminescent immunoassay

E. Applicant:

Theranos, Inc.

F. Proprietary and Established Names:

Theranos™ Herpes Simplex Virus-1 (HSV-1) IgG Assay

G. Regulatory Information:

1. Regulation section:

   866.3305

2. Classification:

   Class II Special Controls

3. Product code:

   MXJ

4. Panel:

   Microbiology

H. Intended Use:

1. Intended use(s):

   The Theranos™ HSV-1 IgG Assay is a chemiluminescent immunoassay intended for the qualitative detection of IgG antibodies to herpes simplex virus type 1 (HSV-l) in human serum, in K2-EDTA anticoagulated human plasma from venous blood, and in human fingerstick K2-EDTA anticoagulated whole blood obtained with the Theranos Capillary Tubes and Nanotainer Tubes. The test is indicated for sexually active individuals and expectant mothers as an aid in the presumptive diagnosis of HSV-l infection. The predictive value of positive and negative results depends on the population's prevalence and the pretest likelihood of HSV-1.

   The test is not FDA cleared for screening blood or plasma donors. The performance of this assay has not been established for use in a pediatric population, neonates and immunocompromised patients.

   The Theranos HSV-1 IgG Assay is for use with the Theranos System which performs automated sample processing steps and result analysis.

2. Indication(s) for use:

   Same as the intended use

3. Special conditions for use statement(s):

   The Theranos HSV-1 IgG Assay is for prescription use only in accordance with 21 CFR 801.109

4. Special instrument requirements:

   Theranos Sample Processing Unit (TSPU)

I. Device Description:

The Theranos anti-HSV-1 IgG Assay is a three-step sandwich chemiluminescent immunoassay with an HSV-1 glycoprotein G (gG) recombinant antigen coated surface, an anti-human IgG detection reagent conjugated to alkaline phosphatase (AP) and chemiluminescent substrate. The Theranos HSV-1 IgG Assay reagents are packaged in a ready-to-use pouched cartridge and are designed to be used directly. No additional preparation of reagents is required. The Theranos HSV-1 IgG Assay is intended to be run on the Theranos™ TSPU Device only. The Theranos TSPU Device performs automated sample processing and signal detection. Raw data collected are analyzed by the Theranos System under the oversight of the Theranos CLIA-certified laboratory. The Theranos TSPU is intended to be used only with Theranos assay cartridges.

J. Substantial Equivalence Information:

1. Predicate device name(s):
   Focus HerpeSelect® 1 and 2 Immunoblot IgG

2. Predicate 510(k) number(s):
   K000238

3. Comparison with predicate:

Similarities		
Item	Device	Predicate
Indications for use	The Theranos™ HSV-1 IgG Assay is a chemiluminescent immunoassay intended for the qualitative detection of IgG antibodies to herpes simplex virus type 1 (HSV-l) in human serum, in K2-EDTA anticoagulated human plasma from venous blood, and in human fingerstick K2-EDTA anticoagulated whole blood obtained with the Theranos Capillary Tubes and Nanotainer Tubes. The test is indicated for sexually active individuals and expectant mothers as an aid in the presumptive diagnosis of HSV-l infection. The predictive value of positive and negative results depends on the population's prevalence and the pretest likelihood of HSV-1. The test is not FDA cleared for screening blood or plasma donors. The performance of this assay has not been established for use in a pediatric population, neonates and immunocompromised patients. The Theranos HSV-1 IgG Assay is for use with the Theranos System which	Focus Diagnostics' HerpeSelect® 1 and 2 Immunoblot IgG test is intended for qualitatively detecting the presence or absence of human IgG class antibodies to HSV-1 and HSV-2 in human sera. The test is indicated for testing sexually active adults or pregnant women for aiding in the presumptive diagnosis of HSV-1 and HSV-2 infection. The predictive value of a positive or negative result depends on the population's prevalence and the pretest likelihood of HSV-1 and HSV-2 infection. The performance of this assay has not been established for use in a pediatric population, for neonatal screening, for testing of immuno-compromised patients, for use by a point of care facility or for use with automated equipment.

Similarities		
Item	Device	Predicate
	performs automated sample processing steps and result analysis.	

Differences		
Item	Device	Predicate
Specimen Type	Venous serum, K2-EDTA anticoagulated human plasma from venous blood, and in human fingerstick K2-EDTA anticoagulated whole blood obtained with the Theranos Capillary Tubes and Nanotainer Tubes	Venous Serum
Technology	Chemiluminescent immunoassay	Nitrocellulose Immunoblot

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

Guidance for Industry and FDA Staff - Class II Special Controls Guidance Document: Herpes Simplex Virus Types 1 and 2 Serological Assays (issued August 9, 2011)

Guidance for Industry and FDA Staff: Assay Migration Studies for In Vitro Diagnostic Devices (issued April 25, 2013)

Guidance for Industry and FDA Staff: Statistical Guidance on Reporting Results from Studies Evaluating Diagnostic Tests (issued March 13, 2007)

CLSI EP05-A3, Evaluation of Precision of Quantitative Measurement Procedures; Approved Guideline—Third Edition

CLSI EP07-A2, Interference Testing in Clinical Chemistry;. Approved Guideline—Second Edition

CLSI EP12-A2, User Protocol for Evaluation of Qualitative Test Performance; Approved Guideline—Second Edition

CLSI EP14-A2, Evaluation of Matrix Effects; Approved Guideline—Second Edition

CLSI EP17-A, Evaluation of Detection Capability for Clinical. Laboratory Measurement Procedures; Approved Guideline—Second Edition

CLSI EP25-A, Evaluation of Stability of In Vitro Diagnostic. Reagents; Approved Guideline

CLSI GP34-A, Validation and Verification of Tubes for. Venous and Capillary Blood Specimen. Collection; Approved Guideline

Test Principle:

During the first incubation step, the HSV-1 IgG antibodies present in the positive control and sample bind to the gG recombinant antigen on the coated surface. Following the first incubation step, unbound materials are removed with a wash cycle. Then the detection reagent-AP conjugate is added and during the second incubation step, the detection reagent-AP conjugate reacts with the HSV-1 IgG antibodies already bound to the capture surface. Following the second incubation, unbound materials are removed with a wash cycle. The chemiluminescent substrate is added to the capture-analyte-detection complex during the third incubation step to initiate the chemiluminescence reaction. Light generated by this reaction is detected and analyzed by the Theranos System using a calibration function to determine the cut-off index (COI) values for the sample and controls. The results for the Positive and Negative controls must be within specified limits for a run to be considered valid

MATERIALS PROVIDED

Theranos Capillary Tubes and Nanotainer Tubes with K_2-EDTA (purple)

The Theranos Capillary Tubes and Nanotainer Tubes are non-sterile, single use only collection devices consisting of two Capillary Tubes paired with two Nanotainer Tubes that are capable of collecting, preserving, and transporting fingerstick whole blood samples for use with the Theranos HSV-1 IgG Assay. Each capillary is coated with di-potassium EDTA (K_2-EDTA) anticoagulant which is intended to preserve the specimen during transport and/or storage (there are no anticoagulants in the Nanotainer Tubes). A needle interfaces with each capillary to transport blood from each capillary into a dedicated Nanotainer Tube.

Theranos Cartridge (HSV-1 IgG Assay)

The Theranos HSV-1 IgG Assay reagents are assembled in a self-contained, ready-to-use pouched cartridge that is sufficient to run one test. The pouched cartridge should be removed from the refrigerator at least 10 minutes prior to use, but must be used within 24 hours after removal from the refrigerator. Any cartridge that has exceeded the 24 hour time limit should be discarded. The cartridge pouch should be kept sealed until it is needed to run a sample. The components of the cartridge are described in Table 1 below:

Table 1: Description of Materials Provided with the Theranos HSV-1 IgG Assay

Capture Surface	Coated with HSV-1 gG-1 recombinant antigen solution containing stabilizers and preservatives.
Detection Reagent (65 µL)	Mouse monoclonal antibody against human IgG, conjugated to alkaline phosphatase (AP) in a solution containing stabilizers and preservatives.
Positive Control (65 µL)	Liquid, human serum based, containing HSV-1 IgG.

Negative Control (65 µL)	Liquid, human serum based, containing no HSV-1 IgG.
Assay Diluent (160 µL)	Phosphate buffered saline (PBS).
Wash Buffer (65 µL)	Tris buffered saline (TBS) with detergent.
Chemiluminescent AP substrate reagent (65 µL)	Chemilumiscent substrate formulation for alkaline phosphatase.

Theranos TSPU Device

The Theranos TSPU Device performs automated sample processing and signal detection. Raw data collected are analyzed by the Theranos System under the oversight of the Theranos CLIA-certified laboratory. The Theranos TSPU is intended to be used only with Theranos assay cartridges.

MATERIALS REQUIRED BUT NOT PROVIDED

- Disposable gloves – gloves must be worn during the sample collection procedure. Gloves must be worn during the sample processing procedure.
- Disposable absorbent workplace cover – for use in the sample collection procedure, to cover the workplace area used for sample collection. For use in the sample processing procedure, to cover the clean, flat workplace surface where the cartridge and sample are handled for sample processing on the TSPU device.
- Antiseptic wipes – for use in the sample collection procedure, to cleanse the patient's fingerstick sample collection site.
- Disinfectant wipes – if required during sample collection procedure, following sample transfer from Capillary Tubes to Nanotainer Tubes, to wipe any excess blood from the outside of the Nanotainer Tubes.
- Sterile safety lancet – single use, disposable, for use in the sample collection procedure to create the fingerstick puncture site.
- Warming device – commercially available, single use, disposable, for use in the sample collection procedure. It is recommended that the patient's finger is warmed for 45 seconds using the warming device prior to the skin puncture.
- Sterile gauze – for use in the sample collection procedure, to wipe any excess blood from the patient's fingertip following sample collection.
- Biohazard bin – For use in the sample processing procedure, to dispose of the used cartridge following sample processing, for use following the sample collection procedure to dispose of single use articles in contact with blood.
- Sharps container – for use in the sample collection procedure, to dispose of the used safety lancet.
- K2-EDTA Tube – a standard K2-EDTA collection tube for venipuncture (if required).

THERANOS PATIENT SERVICE CENTERS – SPECIMEN COLLECTION AND PREPARATION

The Theranos HSV-1 IgG Assay is intended for use with K2-EDTA anticoagulated human plasma from fingerstick whole blood. Fingerstick whole blood samples should be collected with the Theranos Capillary Tubes and Nanotainer Tubes. This device is designed to collect 80µL of whole blood in each of a pair of Nanotainer Tubes (160µL of whole blood in the paired Tubes).

CLIA LABORATORY – SPECIMEN COLLECTION AND PREPARATION

The Theranos HSV-1 IgG Assay is intended for use with human serum from venous blood and K2-EDTA anticoagulated human plasma from venous and fingerstick whole blood. Venous blood should be collected aseptically using approved venipuncture techniques by qualified personnel. For the collection of fingerstick specimens, fingerstick whole blood samples should be collected with the Theranos Capillary Tubes and Nanotainer Tubes in accordance with the instructions provided. For the serum specimens collected by venipuncture, the blood should be allowed to clot, and the serum separated from the clot as soon as possible. Store and ship Nanotainer Tubes in controlled insulated and refrigerated containers specified by Theranos, following Nanotainer Tubes sample storage and shipment instructions as specified by Theranos. Store and ship venous samples in controlled insulated and refrigerated containers specified by Theranos, following venous sample storage and shipment instructions as specified by Theranos.

Upon receipt in the CLIA-certified laboratory, the fingerstick whole blood samples in the Nanotainer Tubes should be centrifuged at 1200g for 5 minutes within 48 hours of sample collection. The venous K2-EDTA anticoagulated whole blood samples should be centrifuged at 1300g for 10 minutes per standard vacutainer protocols.

The separated plasma from fingerstick specimens can remain at room temperature for no longer than 6 hours. If the assay will not be completed within 6 hours, refrigerate the sample at 2 to 8°C. If the assay will not be completed within 48 hours of storing at 2-8°C, the samples should be frozen at –20°C. Frozen specimens should be thawed and mixed well prior to use. A maximum of 3 freeze thaw cycles are allowed.

The minimum volume required from the sample in the collection device is approximately 30 µL of specimen (plasma or serum) (10 µL of specimen is used for the assay and approximately 20 µL of dead volume).

CAUTION: All specimens must be treated as potentially infectious material.

CLIA LABORATORY – THE HSV-1 IGG ASSAY PROCEDURE

To ensure proper test performance, strictly adhere to the following operating instructions:

1. Pouched “HSV-1 IgG Assay, CLIA lab location” cartridges should be stored at 4°C. They should be kept right-side-up as indicated by a sticker on the top side of each pouch.
2. **For fingerstick whole blood samples provided in the Capillary Tubes and Nanotainer Tubes:**
    a. Scan QR code on bottom of Nanotainer Tube into SampleID field of the tracking file.

b. Open cartridge pouch labelled "HSV-1 IgG Assay, CLIA lab location" and discard wrapper and desiccant in biohazard bin.

c. Scan QR code on side of cartridge into Barcode field of tracking file and enter the patient number into the PatientID field.

d. Orient the cartridge such that the barcode is on the right hand side and the Nanotainer Tube slot is on the upper right. The green arrow on the cartridge should point into the device.

e. Transfer 30µL of plasma using a manual pipette into the round vessel highlighted with a red ring near the center of the "Theranos HSV-1 IgG Assay, CLIA lab location" cartridge.

3. **For venous blood collected with a commercially available venous blood EDTA-anti-coagulated collection device or commercially available serum collection device:**
   a. Scan barcode on the sample container into SampleID field of the tracking file.

   b. Open cartridge pouch labelled "HSV-1 IgG Assay, CLIA lab location" and discard wrapper and desiccant in biohazard bin.

   c. Scan QR code on side of cartridge into Barcode field of tracking file and enter the patient number into the PatientID field.

   d. Orient the cartridge such that the barcode is on the right hand side and the Nanotainer Tube slot is on the upper right. The green arrow on the cartridge should point into the device.

   e. Transfer 30µL of plasma or serum using a manual pipette into the round vessel highlighted with a red ring near the center of the "Theranos HSV-1 IgG Assay, CLIA lab location" cartridge.

4. Prompts on the TSPU touch screen should be followed to insert the cartridge into the TSPU and to start the test run.

5. Once the TSPU application has initialized, the Home Screen will appear. Tap the Home Screen to begin.

6. Tapping on the Home Screen brings you to the Open Screen.

7. Touch the Open Button to open the cartridge door on the front of the TSPU. This will start a 90-second countdown timer.

8. If the cartridge is not inserted within the 90-second period, the door will close. If this happens, the screen will go back to the Open Screen (Step 6). Press the Open Button to reopen the cartridge door (Step 7).

9. Insert the cartridge so its green arrow points into the TSPU. Upon detection, the TSPU will pull the cartridge into the TSPU.

10. Once the cartridge is pulled into the TSPU, the screen will indicate that the processing is initializing.

11. Once the initialization is complete, the TSPU will automatically execute the protocol and the screen will display a circular indicator displaying the percentage of the total

time to execute the protocol in its center, and an estimated countdown of the time remaining to complete the protocol.

12. When the protocol is successfully completed, a "complete" message will appear briefly indicating that the process completed successfully, followed by a "Test complete" screen.
13. The final Eject Screen will indicate that the test has been completed and the cartridge may be ejected by pressing the button.
14. The door will open and the cartridge will be ejected. The door will remain open for up to 120 seconds at which time the TSPU retracts the cartridge and shuts the door to maintain the temperature within the TSPU. In that case, the screen will go back to the Eject Screen (Step 13).
15. The cartridge should be discarded into a biohazard bin.
16. The TSPU detects that the ejected cartridge is removed, and the cartridge door will close and navigate back to the Home Screen.

Once the cartridge is loaded into the TSPU the following steps are automatically implemented in sequence over approximately 78 minutes.

1. Sample plasma, negative control material and positive control material are mixed with sample diluent to yield sample diluent and diluted control samples in separate vessels.
2. During the first incubation step, the HSV-1 IgG antibodies present in the controls and sample bind an HSV-1 glycoprotein G (gG) recombinant antigen on a coated surface.
3. Following the first incubation step, unbound materials are removed with a wash cycle.
4. Then the detection reagent-AP conjugate is added and during the second incubation step, the detection reagent-AP conjugate reacts with the HSV-1 IgG antibodies already bound to the capture surface.
5. Following the second incubation, unbound materials are removed with a wash cycle.
6. The chemiluminescent substrate is added to the capture-analyte-detection complex during the third incubation step to initiate the chemiluminescence reaction.
7. Light generated by this reaction is detected and analyzed by the Theranos System using a calibration function to determine the cut-off index (COI) values for the sample.

QUALITY CONTROL (QC)

The Theranos HSV-1 IgG Assay cartridges are completely self-contained and ready-to-use, and include the use of on-board positive and negative controls. Each laboratory should follow applicable local laws, regulations and standard good laboratory practice to establish its own QC ranges and frequency of QC testing. The on-board positive and negative controls are purchased from commercial sources. These on-board control samples are run simultaneously with the assay each time a patient sample is run, processed in parallel with the patient samples, in exactly the same way as the patient sample is processed.

Expected Control Results

Control Type	Expected result
Positive control: Liquid (65 µL), human serum based, containing HSV-1 IgG	Positive
Negative control: Liquid (65 µL), human serum based, containing no HSV-1 IgG.	Negative

The output from these positive and negative control runs are analyzed by the Theranos System for any performance deficiencies in the system in real time. Calibration functions consist of pass/fail limits, for both the positive control and the negative control. If the control value lies outside the pass limit, the run is considered to be invalid. If either control fail, or if it is out of range, the test result will be INVALID as described in Table 2 below.

INTERPRETATION OF RESULTS

The result returned by the Theranos HSV-1 IgG test automatically factors in the validity of on-board controls. The user obtains a result with one of the following possibilities:

Table 2: Interpretation of results

Result	Interpretation	Follow up testing recommendation
POSITIVE	HSV-1 specific IgG antibodies detected	None
NEGATIVE	HSV-1 specific IgG antibodies not detected	None
EQUIVOCAL	HSV-1 specific IgG antibody status equivocal	CLIA Laboratory: Samples should be re-tested. If on re-test, the sample is still equivocal, then a second sample should be drawn within 4-6 weeks and tested.
INVALID	Invalid result	The test result should be discarded and the test should be re-run.

M. Performance Characteristics (if/when applicable):

1. Analytical performance:

a. Precision/Reproducibility:

Precision –CLIA Laboratory Model, Venous Serum

A study for estimating the precision of the Theranos HSV-1 IgG Assay for venous serum samples in a CLIA Laboratory model was performed by testing a panel of 6 serum samples spanning the analytical range [negative (A), high negative (B), equivocal (C), low positive (D), moderate positive (E), and positive (F)]. The precision study was conducted at one site with thirty five (35) TSPU devices, three (3) lots of cartridges and sixteen (16) operators in total. The study duration was 13 days in total. Details of the study design for different samples are presented in Table 3 below.

Table 3: Design of Precision Study: Numbers of Replicates, Devices, Days and Operators

Panel Member	Valid Replicates				No. of Devices	No. of Days	No. of Operators	No. of Invalid Replicates
	Total	Lot 1	Lot 2	Lot 3				
A (Negative)	91	26	38	27	35	7	14	3
B (High Neg.)	88	24	37	27	28	7	14	2
C (Equivocal)	78	27	44	8	35	8	16	3
D (Low Pos.)	80	25	27	28	11	2	4	4
E (Mod. Pos.)	64	25	13	26	13	2	6	1
F (Positive)	69	25	19	25	15	2	4	3

Results of the precision study are presented in Table 4.

Table 4: Summary of Precision Study Results

Panel Member	Mean (COI)		Repeatability (same device, same lot)	Between-device	Between-lot	Precision (same device, different lot)	Precision (different device, same lot)	Precision (different device, different lot)
A (Negative)	0.425	SD	0.049	0.007	0.000	0.049	0.049	0.049
		%CV	11.5%	1.6%	0%	11.5%	11.6%	**11.6%**
B (High Neg.)	0.648	SD	0.086	0.011	0.029	0.091	0.087	0.092
		%CV	13.3%	1.7%	4.5%	14.1%	13.4%	**14.2%**
C (Equivocal)	1.016	SD	0.093	0.062	0.065	0.113	0.112	0.129
		%CV	9.1%	6.1%	6.4%	11.1%	11.0%	**12.7%**
D (Low Pos.)	1.727	SD	0.208	0.098	0.013	0.208	0.230	0.230
		%CV	12.0%	5.7%	0.8%	12.0%	13.3%	**13.3%**
E (Mod. Pos.)	3.809	SD	0.305	0.276	0.108	0.324	0.411	0.425
		%CV	8.0%	7.3%	2.8%	8.5%	10.8%	**11.2%**
F (Positive)	8.996	SD	0.807	0.437	0.000	0.807	0.918	0.918
		%CV	9.0%	4.9%	0.0%	9.0%	10.2%	**10.2%**

Table 5 presents percent of invalid results and percents of negative, equivocal and positive among valid results for each sample.

Table 5: Percent of Invalid Results and Percents of Negative, Equivocal and Positive among Valid Results

Panel Member	Mean (COI)	Number of Replicates	Percent of Invalid	Percent of Negative among Valid	Percent of Equivocal among Valid	Percent of Positive among Valid
A (Negative)	0.425	94	3.2% (3/94)	100% (91/91)		
B (High Neg.)	0.648	90	2.2% (2/90)	100% (88/88)		
C (Equivocal)	1.016	81	3.7% (3/81)	17.9% (14/78)	60.3% (47/78)	21.8% (17/78)
D (Low Pos.)	1.727	84	4.8% (4/84)			100% (80/80)
E (Mod. Pos.)	3.809	65	1.5% (1/65)			100% (64/64)
F (Positive)	8.996	72	4.2% (3/72)			100% (69/69)

The results of the study demonstrate that the precision of the Theranos HSV-1 IgG Assay (including different TSPU devices, different lots of cartridges, and different operators) when performed in a CLIA Laboratory was in the range 10.2% to 14.2%.

Precision –CLIA Laboratory Model, Fingerstick Whole Blood

A study for estimating the precision of the Theranos HSV-1 IgG Assay for fingerstick whole blood samples in a CLIA Laboratory model was performed by testing a panel of 3 fingerstick plasma samples spanning the analytical range [high negative (P), equivocal (Q), moderate positive (R)]. The precision study was conducted at one site with thirty-six (36) TSPU devices, three (3) lots of cartridges and nine (9) operators in total. The study duration was 4 days in total. Details of the study design for different samples are presented in Table 6 below.

Table 6: Design of Precision Study: Numbers of Replicates, Devices, Days and Operators

Panel Member	Valid Replicates				No. of Devices	No. of Days	No. of Operators	No. of Invalid Replicates
	Total	Lot 1	Lot 2	Lot 3				
P (High Neg.)	168	56	56	56	30	4	9	3*
Q (Equivocal)	168	56	56	56	29	4	9	2*
R (Mod. Pos.)	168	56	56	56	27	4	9	2*

*All invalid replicates were repeated.

Results of the precision study are presented in Table 7.

Table 7: Summary of Precision Study Results

Panel Member	Mean (COI)		Repeatability (same device, Same Lot)	Between-Device	Between-Lot	Precision (same device, different lot)	Precision (different device, same lot)	Precision (different device, different lot)
P (High Neg.)	0.888	SD	0.083	0.006	0.050	0.096	0.083	0.097
		%CV	9.3%	0.7%	5.6%	10.9%	9.3%	**10.9%**
Q (Equivocal)	1.047	SD	0.094	0.025	0.069	0.117	0.098	0.119
		%CV	9.0%	2.4%	6.6%	11.1%	9.3%	**11.4%**
R (Mod. Pos.)	3.241	SD	0.342	0.122	0.157	0.377	0.363	0.396
		%CV	10.6%	3.8%	4.9%	11.6%	11.2%	**12.2%**

Table 8 presents percent of invalid results and percents of negative, equivocal and positive among valid results for each sample.

Table 8: Percents of Positive, Equivocal, Negative and Invalid Results

Panel Member	Mean (COI)	Number of Replicates	Percent of Invalid	Percent of Negative among Valid	Percent of Equivocal among Valid	Percent of Positive among Valid
P (High Neg.)	0.888	171	1.8% (3/171)	58.3% (98/168)	40.5% (68/168)	1.2% (2/168)
Q (Equivocal)	1.047	170	1.2% (2/170)	6.5% (11/168)	63.1% (106/168)	30.4% (51/168)
R (Mod. Pos.)	1.016	170	1.2% (2/170)			100% (168/168)

The results of the study demonstrate that the precision of the Theranos HSV-1 IgG Assay (including different TSPU devices, different lots of cartridges, and different operators) when performed in a CLIA Laboratory was in the range from 10.9% to 12.2%.

Reproducibility

A study designed to process multiple fingerstick whole blood samples from individual subjects was performed to evaluate the reproducibility of the Theranos HSV-1 IgG Assay when used with Theranos Capillary Tubes and Nanotainer Tubes. The study was conducted at 3 collection sites with 10 subjects at each site. From each of 30 subjects, 9 Capillary Tubes and Nanotainer Tubes from 3 manufacturing lots (i.e. 3 Capillary Tubes and Nanotainer Tubes per lot) and 2 serum separator tubes (SSTs) were collected. Each subject had the following measurements:

- Each of the 9 Capillary Tubes and Nanotainer Tubes was tested. These data were used for the evaluation of Between-Capillary Tubes and Nanotainer Tubes imprecision, Between-lot imprecision and Total imprecision that includes Between-Capillary Tubes and Nanotainer Tubes and Between-lot imprecisions.
- One Nanotainer Tube (from one of the 3rd lot of Capillary Tubes and Nanotainer Tubes for each subject) was tested in duplicate via recovering a sample from one Capillary Tubes and Nanotainer Tubes device and transferring a sample to another Capillary Tubes and Nanotainer Tubes device. These data were used for evaluation of Within-Capillary Tubes and Nanotainer Tubes imprecision.
- Each of the 2 SSTs was tested. These data were used for evaluation of Between-SST imprecision.

For samples with mean COI value at the baseline ≥0.5, percent differences were calculated and for samples with mean COI value at the baseline <0.5, differences were calculated. Table 9 summarizes the results of the precision study broken down by collection site and by high or low COI subjects; the variability metrics are averaged across all subjects within the site.

Table 9: Summary of Results of the Reproducibility Study

Collection Site	Subjects	Capillary Tubes and Nanotainer Tubes				SST
		Within-Capillary Tubes and Nanotainer Tubes (%CV or SD)	Between-Capillary Tubes and Nanotainer Tubes (%CV or SD)	Between-Lot (%CV or SD)	Total (%CV or SD)	Between-SST (%CV or SD)
1	6 subjects with COI values 1.4 – 13.5	%CV=6.0%	%CV = 9.0%	%CV = 6.8%	%CV=12.6%	%CV=9.6%
	4 subjects with COI values 0.03-0.28	SD=0.008	SD = 0.015	SD = 0.016	SD = 0.024	SD=0.11
2	7 subjects with COI values 1.6 – 16.8	%CV=8.2%	%CV=9.2%	%CV=3.2%	%CV=10.8%	%CV=12.5%
	3 subjects with COI values 0.07-0.19	SD=0.009	SD=0.011	SD=0.008	SD=0.015	SD=0.019
3	5 subjects with COI values 4.5 – 14.3	%CV=8.2%	%CV=8.1%	%CV=6.0%	%CV=11%	%CV=12.4%
	5 subjects with COI values 0.02-0.32	SD=0.08	SD=0.019	SD=0.013	SD=0.025	SD=0.021
Combined	18 subjects with COI values 1.4-16.8	%CV=7.5%	%CV=8.8%	%CV=5.2%	%CV=11.4%	%CV=11.5%
	12 subjects with COI values 0.02-0.32	SD=0.008	SD=0.015	SD=0.013	SD=0.022	SD=0.017

- Within-Capillary Tubes and Nanotainer Tubes imprecision was %CV=7.5% for aggregated subjects with a mean COI ≥0.5 and SD=0.008 for aggregated subjects with mean COI <0.5.

- Total imprecision including Between-Capillary Tubes and Nanotainer Tubes and Between-lot imprecisions was %CV= 11.4% for aggregated subjects with a mean COI ≥0.5 and SD=0.022 for aggregated subjects with a mean COI<0.5.

- Between- serum separator tubes imprecision was %CV=11.5% for aggregated subjects with a mean COI ≥0.5 and SD=0.017 for aggregated subjects with a mean COI <0.5.

b. Linearity/assay reportable range:

Not Applicable

c. Traceability, Stability, Expected values (controls, calibrators, or methods):

Controls: The two on-board controls used in the test are from commercially available sources. Acceptable limits for control measurements were established by averaging 813 runs. Any control measurement outside the acceptable range invalidates the cartridge run.

Calibrators: Calibrators for factory calibration are formulated using commercially available calibrators and an in-house standard to obtain three calibrator levels at COI values of 0.9, 1.1 and 2.0. Calibration of Theranos HSV-1 IgG assay is tied to a particular lot of reagents, and a particular lot of cartridges. The cut-off is set for the lot of cartridges based on the Relative Light Units value of the cut-off calibrator. The other calibrators are used to verify the modulation of the assay. The modulation should be within specified conditions. If these conditions are not satisfied, the lot is considered to not have sufficient modulation and is disqualified.

Analyte Stability

An analyte stability study was performed to characterize the stability of HSV-1 IgG in clinical matrices as measured by the Theranos HSV-1 IgG Assay under different sample storage conditions and time periods as shown in Table 10.

Table 10: Summary of Analyte Storage Conditions and Durations for Different Sample Types and Matrices Claimed for Theranos HSV-1 IgG Assay

Condition	Venous Serum	Venous K_2-EDTA Plasma	Fingerstick K_2-EDTA Plasma	Fingerstick K_2-EDTA Whole Blood
Stored at 2-8°C	48 hr	48 hr	48 hr	48 hr
Stored at room temperature (20-25°C)	6 hr	6 hr	6 hr	6 hr

Condition	Venous Serum	Venous K_2-EDTA Plasma	Fingerstick K_2-EDTA Plasma	Fingerstick K_2-EDTA Whole Blood
Stored at -20°C	1 week	1 week	1 week	N/A
Freeze/thaw cycles	3	3	3	N/A

Within 2 hours after collection, one aliquot of each sample type or matrix was tested with the Theranos HSV-1 IgG Assay in duplicate, to establish the value at baseline. The samples were stored in Nanotainer Tubes under the appropriate conditions. Comparison of an average of two replicates at the predetermined time points with the average of two replicates at baseline was performed. For samples with a mean COI value at the baseline ≥0.5, percent differences were calculated and for samples with a mean COI value at the baseline <0.5, differences were calculated.

Acceptance criteria were as follows: i) a difference averaged over all samples with a baseline mean COI value ≥0.5 must be less than ±10% and a difference averaged over all samples with a baseline COI mean <0.5 must be less than 0.02 and ii) for each sample, an observed difference must be less than 15% for the samples with a baseline mean COI value ≥0.5 and must be less than 0.08 for the samples with a baseline mean COI value <0.5 (the range of differences expected if there is no effect of storage on the HSV-1 IgG analyte).

Table 11: Summary of Mean Absolute Difference Measures for all Storage Conditions and Sample Types or Matrices

	Sample Type and Matrix	Samples with a baseline COI < 0.5		Samples with a baseline COI > 0.5	
		Difference averaged over all samples	The largest observed difference among samples	Percent difference averaged over all samples	The largest observed percent difference among samples
Stored at 2-8C, 48 hrs	Venous serum	0.006	0.006	1.0%	13.6%
	Venous K2-EDTA plasma	-0.007	-0.007	2.3%	13.3%
	Fingerstick K2-EDTA plasma from whole blood	0.003	0.003	-0.4%	13.9%
Stored at -20, 1 week	Venous serum	0.008	0.015	0.8%	13.3%
	Venous K2-EDTA plasma	0.003	0.005	-1.0%	12.7%
	Fingerstick K2-EDTA plasma from whole blood	0.001	0.008	1.8%	-13.9%
Freeze thaw cycles, n=3	Venous serum	0.007	0.021	-0.1%	13.6%
	Venous K2-EDTA plasma	0.021	0.037	-1.7%	-13.4%
	Fingerstick K2-EDTA plasma from whole blood	0.006	0.022	-1.0%7	13.6%
Stored at room temp, 6 hrs	Venous serum	-0.001	-0.011	-3.2%	-11.9%
	Venous K2-EDTA plasma	0.002	0.022	0.1%	13.7%
	Fingerstick K2-EDTA plasma from whole blood	-0.004	-0.026	1.1%	13.9%

d. Detection limit:

Not Applicable

e. Analytical specificity:

Interfering Substances

A study was designed and performed (in accordance with CLSI EP07-A2) to evaluate the performance of the Theranos HSV-1 IgG Assay in the presence of potentially interfering substances to assess the impact of these endogenous substances and commonly used drugs on the performance of the Theranos HSV-1 IgG Assay. Interferents were tested with three serum samples (negative (mean COI 0.024), high negative (mean COI 0.77) and low positive (mean COI 1.52)) that were contrived by using a high positive sample and diluting it with pooled negative serum. Samples were spiked with the interferent at levels shown in Table 12. Each serum pool was tested in duplicate.

For the low positive and the high negative pools, the acceptance criteria were a mean recovery within +/- 20% of the value of the unspiked sample (i.e., in the absence of the potential interferent or drug). All low positive and high negative samples showed a signal change of less than 15% for all interfering substances. All positive samples remained positive and all negative samples remained negative upon spiking of drug or other interferents. For the negative pool, the acceptance criterion was a deviation of less than 0.02 COI. All negative samples showed a mean deviation of ≤0.02 COI, except Intralipid. Intralipid spikes did not show any effect on recovery for near cut-off samples, high negative and low positive samples.

Table 12: Summary of Interfering Substances Studies: Endogenous Interferents and Drug Interferents

		Negative Pool		High Negative Pool		Low Positive Pool	
Interferent	**Level**	**Mean COI**	**ΔCOI**	**Mean COI**	**% Recovery**	**Mean COI**	**% Recovery**
Hemoglobin	1000 mg/dL	0.025	0.00	0.69	90	1.71	113
Bilirubin	20 mg/dL	0.024	0.00	0.68	88	1.61	106
Intralipid	2000 mg/dL	0.053	0.03	0.81	105	1.60	105
Acetylcysteine	150 mg/L	0.019	-0.004	0.68	88	1.40	92
Ampicillin-Na	1000 mg/L	0.025	0.001	0.76	99	1.44	95
Ascorbic acid	300 mg/L	0.027	0.003	0.75	97	1.67	110
Ca-Dobesilate	200 mg/L	0.027	0.004	0.70	91	1.51	99
Cyclosporine	5 mg/L	0.031	0.008	0.74	97	1.53	101
Cefoxitin	2500 mg/L	0.027	0.003	0.74	97	1.52	100

		Negative Pool		High Negative Pool		Low Positive Pool	
Interferent	**Level**	**Mean COI**	**ΔCOI**	**Mean COI**	**% Recovery**	**Mean COI**	**% Recovery**
Heparin	5000U	0.020	-0.003	0.80	103	1.52	100
Levodopa	20 mg/L	0.030	0.006	0.68	88	1.42	94
Methyldopa+1.5h20	20 mg/L	0.024	0.000	0.74	97	1.37	90
Metronidazole	200 mg/L	0.039	0.016	0.74	96	1.38	91
Phenylbutazone	400 mg/L	0.021	-0.002	0.74	96	1.42	94
Doxycycline	50 mg/L	0.024	0.000	0.71	92	1.35	89
Acetylsalicylic acid	1000 mg/L	0.026	0.002	0.75	97	1.37	90
Rifampicin	60 mg/L	0.014	-0.009	0.69	90	1.35	89
Acetaminophen	200 mg/L	0.034	0.010	0.64	83	1.68	111
Control		0.024	0.000	0.77	100	1.52	100

Cross-reactivity

A study was performed to evaluate the performance of the Theranos HSV-1 IgG Assay in the presence of IgG antibodies against twenty-one (21) infectious agents defined as potential cross-reactants in the FDA guidance on HSV serological assays. Banked serum samples confirmed positive for IgG against the infectious agents of interest were acquired from commercial vendors. At least three (3) samples, independently confirmed as positive for that agent and negative for HSV-1 IgG on the reference method, were tested on the Theranos HSV-1 IgG Assay in order to rule out cross-reactivity of the Theranos HSV-1 IgG Assay with IgG against a potential cross reactant. The results of this study are displayed in Table 13 below.

Table 13: Summary of Cross-reactivity Study on Theranos HSV-1 IgG Assay

Organism/Condition	**No.**	**Reference HSV-1 Assay**	**Theranos HSV-1 Positive**	**Theranos HSV-1 Negative**	**Theranos HSV-1 Equivocal**
Epstein Barr Virus (IgG)	6	Negative	0	6	0
Epstein Barr Virus (IgM)	1	Negative	0	1	0
HPV	4	Negative	0	4	0

Organism/Condition	No.	Reference HSV-1 Assay	Theranos HSV-1 Positive	Theranos HSV-1 Negative	Theranos HSV-1 Equivocal
Rubella (IgG)	13	Negative	0	13	0
HSV-2 (IgG)	40	Negative	0	40	0
HAMA samples	4	Negative	0	4	0
Treponema pallidum	8	Negative	0	7	1*
Rheumatoid Factor (RF)	8	Negative	1**	7	0
Anti-nuclear antibody (ANA)	8	Negative	0	8	0
Sjogren's Syndrome	3	Negative	0	3	0
CMV (IgG)	5	Negative	0	5	0
CMV (IgM)	2	Negative	0	2	0
Chlamydia trachomatis (IgG)	10	Negative	0	10	0
HCV (IgG)	3	Negative	0	3	0
HBsAg	3	Negative	0	3	0
VZV IgG	5	Negative	0	5	0
Measles IgG	5	Negative	0	5	0
HIV-1 (IgG)	4	Negative	0	4	0
Toxoplasma IgG	4	Negative	0	4	0
Candida albicans Ag	3	Negative	0	3	0
Systemic Lupus	3	Negative	0	3	0

*Systematic cross-reactivity ruled out (7/8 samples in same category tested negative)

**Confirmed as positive upon retest; systematic cross-reactivity ruled out (7/8 samples in same category tested negative)

f. Assay cut-off:

A study was performed to establish the cut-off and the limits of the equivocal zone for the Theranos HSV-1 IgG Assay using 192 serum samples. Then 120 independent serum samples were analyzed to validate the established cut-off. The calibrators were assigned COI values based on the established assay cut-off, the cut-off for positive results (COI of

1.1) and the cut-off for negative results (COI of 0.9). The results of the cut-off validation study are displayed in Table 14 below.

Table 14: Performance of Selected Cut-off on Independent Sample Set

Agreement Classification	Percent Agreement	95% Confidence Interval
NPA	96.0% (47/49)	86.3-98.9
PPA	97.1% (69/71)	90.3-99.2

2. Comparison studies:

a. Method comparison with predicate device:

Fingerstick Plasma – CLIA Laboratory Model

To demonstrate the performance of the Theranos HSV-1 IgG Assay for fingerstick whole blood samples were collected at 3 Theranos Patient Service Centers (TPSCs) and processed at the CLIA-certified laboratory.

At each site, fingerstick whole blood samples were collected into a pair of Theranos Capillary Tubes and Nanotainer Tubes, and venous samples were collected into serum tubes from 20, 16 and 25 adult subjects at three collection sites.

Samples were shipped refrigerated to the Theranos CLIA-certified laboratory in Palo Alto, CA. Upon receipt, fingerstick whole blood samples in the Nanotainer Tubes were centrifuged at 1200g for 5 minutes. Plasma was extracted and processed and analyzed on the Theranos System. All samples were processed or frozen as plasma within 48 hours of draw. The venous samples were processed into serum for testing with the reference method (FOCUS HerpeSelect Immunoblot).

A summary of the performance information is shown in the following Table 15.

Table 15: Summary of Method Comparison for Samples Collected at 3 Theranos Patient Service Centers

		Reference Result	
		POS	NEG
Theranos Result	POS	38	0
	NEG	1	22

	Point Estimate	95% Confidence Interval
Sensitivity	97.4% (38/39)	86.8 – 99.6
Specificity	100% (22/22)	85.1 – 100

b. Matrix comparison:

The effect of anticoagulants and different sample types (fingerstick and venous) on the performance of the Theranos HSV-1 IgG Assay was determined by comparing matched venous serum, venous K2-EDTA plasma, and fingerstick K2-EDTA plasma samples from 70 donors. Forty-three matched sample sets were contrived to have analyte values close to the cut-off. The acceptance criterion was a recovery of positive plasma samples within ± 20% of the corresponding serum reference value (serum drawn into primary tubes without gel). For negative samples, the acceptance criteria was a difference of <= 0.02 COI from the corresponding serum value. All anticoagulant–treated plasma samples met this criterion. Weighted Deming regression was performed. The slope and an intercept of the regression line and their 95% confidence intervals along with correlation coefficients are shown in Table 16 and a graphical depiction is shown in Figure 1.

Table 16: Summary of Weighted Deming Regression Analysis Performed on Matrix Equivalency Data for Venous Plasma and Fingerstick Plasma Samples.

Sample type/Matrix	Correlation coefficient	Slope	95% confidence interval on slope	Intercept	95% confidence interval on intercept
Venous plasma	0.992	0.993	[0.967, 1.019]	0.000	[-0.003, 0.003]
Fingerstick plasma	0.995	1.009	[0.973, 1.044]	-0.003	[-0.006, -0.001]

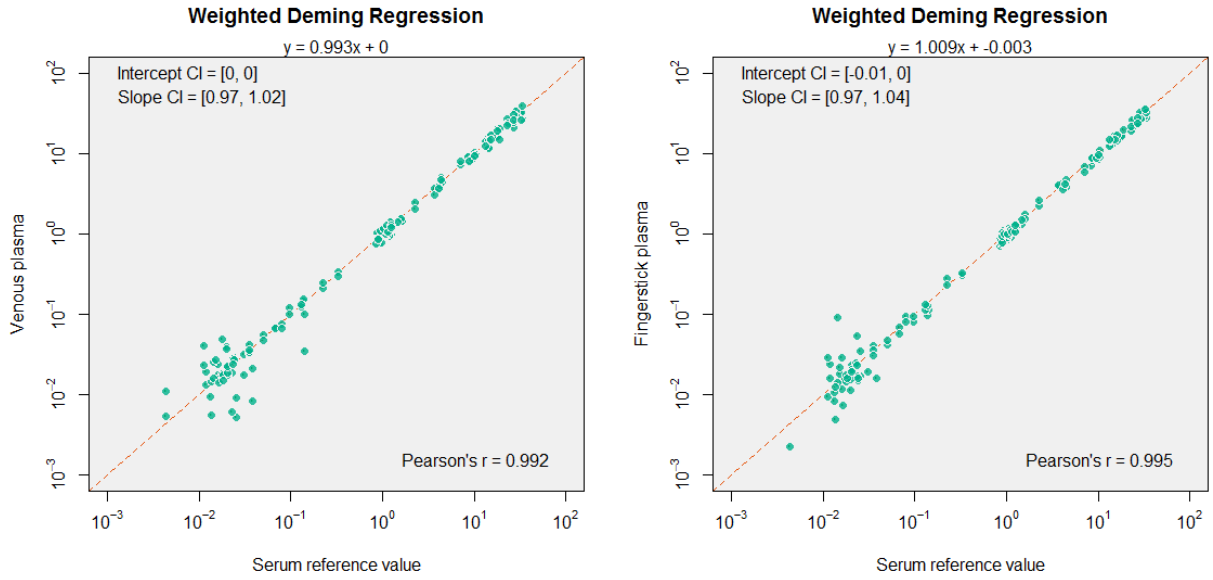

Figure 1: Regression Analysis for Matrix Equivalency Study

3. Clinical studies:

a. Clinical Sensitivity:

Not Applicable

b. Clinical specificity:

Not Applicable

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

Clinical Performance in the Intended Use Populations (CLIA Laboratory Model)

A clinical study was conducted to characterize the performance of the Theranos HSV-1 IgG Assay in the Theranos CLIA-certified Laboratory in comparison to the FOCUS HerpeSelect Immunoblot (as the reference method for performance analysis).

Prospectively collected, archived venous serum samples collected from pregnant women and sexually active adults (18 years and older) who had a prescription for a HSV-1 IgG test. Samples were obtained from multiple specimen sources covering 10 US states and Mexico.

The equivocal results on the Focus HerpeSelect Immunoblot (that repeatedly tested equivocal) were resolved using a validated western blot reference test (University of Washington, Seattle) as per the instructions of the package insert for the reference method. Ten samples from the sexually active adult sub-population tested initially equivocal on the Focus HerpeSelect Immunoblot and were resolved by the University of Washington western blot as 2 negatives and 7 positives. One sample was not resolved. There were no samples in the sexually active adult sub-population that returned an invalid result.

In the pregnant women sub-population, 8 samples tested initially equivocal on the Focus HerpeSelect immunoblot. Of these, 4 samples could not be resolved by the University of Washington western blot due to insufficient volume availability. Of the remaining 4 samples, 1 (one) were resolved as negative and 3 as positive. There were 3 samples that returned an invalid result on the Theranos HSV-1 IgG test. These samples were rerun and resulted in valid results included in the analysis. The clinical performance information for the sexually active adults and pregnant women population is presented in Tables 17 and 18 below:

Table 17: Summary of Theranos HSV-1 IgG Test Performance with Sexually Active Adult Population

		Reference Method			
		Positive	Equivocal	Negative	Total
Theranos HSV-1 IgG Assay	Positive	137	0	2	139
	Equivocal	1	0	1	2
	Negative	5	1	113	119
	Total	143	1	116	***260***

	Point Estimate	95% Confidence Interval
Sensitivity	95.1% (137/144)	90.3-97.6
Specificity	97.4% (113/116)	92.7-99.1

Table 18: Summary of Theranos HSV-1 IgG Test Performance with Pregnant Women Population

		Reference Method			
		Positive	Equivocal	Negative	Total
Theranos HSV-1 IgG Assay	Positive	188	1	4	193
	Equivocal	0	1	0	1
	Negative	2	2	100	104
	Total	190	4	104	***298***

	Point Estimate	95% Confidence Interval
Sensitivity	97.9% (188/192)	94.8-99.2
Specificity	95.2% (100/105)	89.3-98.0

CDC Panel Testing:

The objective of this study was to demonstrate agreement of the Theranos HSV-1 IgG Assay with the CDC panel. A panel of well characterized serum samples (n=100) was obtained from the U.S. Centers for Disease Control and Prevention (CDC). The CDC sample panel was tested with the HSV-1 IgG Assay and the results obtained by Theranos were sent to the CDC for confirmation. The panel consisted of 54 positives and 46 negatives. The Theranos HSV-1 IgG Assay demonstrated 100% agreement with the results provided by the CDC.

Low Prevalence Population

Serum samples were collected from a low prevalence population: individuals who are not sexually active, and without a recent or current sexually transmitted disease (Hepatitis, Syphilis, HIV, HPV, Trichomonas, Chlamydia, and Gonorrhoeae) as determined in an interview. Performance of the assay on this population is summarized in Table 19. The Samples were obtained from multiple specimen sources covering 10 US states and Mexico.

Table 19: Summary of Theranos HSV-1 IgG Assay Performance with Low Prevalence Population

		Reference method			
		Positive	Equivocal	Negative	Total
Theranos HSV-1 IgG Assay	Positive	32	0	0	32
	Equivocal	0	0	0	0
	Negative	0	1	49	50
	Total	32	1	49	***82***

	Point Estimate	95% Confidence Interval
Sensitivity	97.0% (32/33)	84.7-99.5
Specificity	100% (49/49)	92.7-100

4. Clinical cut-off**:**

Not Applicable

5. Expected values/Reference range:

Expected Values

The Theranos HSV-1 IgG Assay was used to evaluate the prevalence of HSV-1 IgG antibodies in individuals for whom an HSV-1 IgG test was ordered by a physician including pregnant women. The study populations for the Theranos HSV-1 IgG Assay consisted of a total of 558 subjects, with 260 sexually active adults and 298 individuals identified as pregnant women. The result for 1 out of the 558 subjects is not reported, as indicated in Table 20 (1 subject), giving a total of 557 subjects. The data for the intended use population (557 specimens) have been summarized according to age group in decades, gender, number of reactive results, and number of non-reactive results. The data for the intended use population have been summarized in Table 20 (259 specimens from sexually active adult subjects) and Table 21 (298 specimens from pregnant subjects).

Table 20: Expected Results for Theranos HSV-1 IgG Assay in Adult Subjects

Age Range	Gender	Reactive	Equivocal	Non-Reactive
		N/Total (%)	N/Total (%)	N/Total (%)
16 to 19	Male	0/0 (0)	0/0 (0)	0/0 (0)
16 to 19	Female	1/4 (25)	0/4 (0)	3/4 (75)
20 to 29	Male	8/18 (44.4)	1/18 (5.6)	9/18 (50)
20 to 29	Female	29/73 (39.7)	0/73 (0)	44/73 (60.3)
30 to 39	Male	5/10 (50)	0/10 (0)	5/10 (50)
30 to 39	Female	33/62 (53.2)	0/62 (0)	29/62 (46.8)
40 to 49	Male	5/10 (50)	0/10 (0)	5/10 (50)
40 to 49	Female	16/27 (59.3)	0/27 (0)	11/27 (40.7)
50 to 59	Male	17/20 (85)	0/20 (0)	3/20 (15)
50 to 59	Female	9/11 (81.8)	0/11 (0)	2/11 (18.2)
60 to 69	Male	5/6 (83.3)	0/6 (0)	1/6 (16.7)
60 to 69	Female	5/10 (50)	1/10 (10)	4/10 (40)
70 to 79	Male	3/4 (75)	0/4 (0)	1/4 (25)
70 to 79	Female	1/3 (33.3)	0/3 (0)	2/3 (66.7)
80 to 89	Male	0/0 (0)	0/0 (0)	0/0 (0)
80 to 89	Female	1/1 (100)	0/1 (0)	0/1 (0)
Total*		138/259 (53.3)	2/259 (0.8)	119/259 (45.9)

*1 sample not reported since age information was not available

Table 21: Expected Results for Theranos HSV-1 IgG Assay in Pregnant Subjects

Age Range	Gender	Reactive	Equivocal	Non-Reactive
		N/Total (%)	N/Total (%)	N/Total (%)
18 to 19	Female	13/13 (100)	0/13 (0)	0/13 (0)
20 to 29	Female	114/175 (65.1)	1/175 (0.6)	60/175 (34.3)
30 to 39	Female	61/104 (58.7)	0/104 (0)	43/104 (41.3)
40 to 49	Female	5/6 (83.3)	0/6 (0)	1/6 (16.7)
Total		193/298(65)	1/298 (0.3)	104/298 (35)

The hypothetical positive and negative predictive values (PPV, NPV) for the two intended use populations are shown in Table 22. The calculations are based on the specificity and sensitivity values for the Theranos HSV-1 IgG Assay determined in the clinical study;

1. Specificity of 97.4% and Sensitivity of 95.1% in sexually active adults
2. Specificity of 95.2% and Sensitivity of 97.4% in pregnant women

Table 22: Hypothetical Predictive Values

Prevalence (%)	Sexually Active Adults		Pregnant Women	
	PPV (%)	NPV (%)	PPV (%)	NPV (%)
50	93.8	92.6	92.1	91.7
45	93.2	93.2	91.3	92.4
40	92.4	93.8	90.3	93.0
35	91.4	94.2	89.1	93.5
30	90.1	94.6	87.5	94.0
25	88.3	94.9	85.3	94.3
20	85.8	95.2	82.3	94.7
15	82.0	95.5	77.7	95.0
10	75.2	95.7	69.9	95.2
5	60.2	96.0	53.8	95.5

N. Instrument Name:

Theranos Sample Processing Unit (TSPU)

Theranos Laboratory Automation System (TLAS)

O. System Descriptions:

1. Modes of Operation:

Does the applicant's device contain the ability to transmit data to a computer, webserver, or mobile device?

Yes _____X___ or No _____

Does the applicant's device transmit data to a computer, webserver, or mobile device using wireless transmission?

Yes _____ or No __X_____

2. Software:

   FDA has reviewed applicant's Hazard Analysis and software development processes for this line of product types:

   Yes ___X_____ or No _____

3. Specimen Identification:

   Sample identification is manually entered.

4. Specimen Sampling and Handling:

   Each specimen is manually loaded into an assay cartridge.

5. Calibration:

   The TSPU is calibrated by the manufacturer.

6. Quality Control:

   Specific assay controls are included within each assay cartridge.

P. Proposed Labeling:

The labeling is sufficient and it satisfies the requirements of 21 CFR Part 809.10.

Q. Conclusion:

The submitted information in this premarket notification is complete and supports a substantial equivalence decision.