

**510(k) SUBSTANTIAL EQUIVALENCE DETERMINATION  
DECISION SUMMARY  
ASSAY ONLY TEMPLATE**

**A. 510(k) Number:**

K073039

**B. Purpose for Submission:**

Traditional, original 510(k) submission

**C. Measurand:**

Sperm concentration

**D. Type of Test:**

This is a one step, immuno-chromatographic assay.

**E. Applicant:**

Princeton BioMeditech Corporation

**F. Proprietary and Established Names:**

SpermCheck® Vasectomy

**G. Regulatory Information:**

1. Regulation section:

No regulation

2. Classification:

Class II

3. Product code:

MNA

4. Panel:

Obstetrics and Gynecology (85)

## **H. Intended Use:**

1. Intended use(s):

SpermCheck Vasectomy is a rapid qualitative test that detects low concentrations of sperm at or above 250,000 sperm/mL, in human semen as an aid for vasectomized men. For *in vitro*, over the counter home use.

2. Indication(s) for use:

N/A

3. Special conditions for use statement(s):

N/A

4. Special instrument requirements:

N/A

## **I. Device Description:**

The SpermCheck Vasectomy test is designed to detect the presence or absence of sperm in semen following a vasectomy. Since sperm persist in the male reproductive tract for some time after a vasectomy it is necessary to continue other methods of contraception until those sperm have been voided. With this simple Sperm Check Vasectomy test the user can quickly know when the amount of sperm in his ejaculate has dropped to very low levels and it is safe to discontinue other forms of contraception. The SpermCheck Vasectomy test device is designed to give a positive result at or above 250,000 sperm/mL and negative result below 250,000 sperm/mL.

## **J. Substantial Equivalence Information:**

1. Predicate device name(s):

a. Hemacytometer

b. Fertell Male Fertility Test

c. FertilMARQ™ Male Fertility Test

2. Predicate K number(s):

a. N/A

b. K041039

c. K011679

3. Comparison with predicate:

<b>Similarities</b>		
<b>Item</b>	<b>Device</b>	<b>Predicate</b>
Test Type	Qualitative Test	Fertell: Same FertilMARQ: Same
Sample Type	Human semen	Hemocytometer: Same Fertell: Same FertilMARQ: Same
Assay Design	Chromatographic immunoassay	Fertell: Same
Assay Principle	Colored label bound to sperm	Fertell: Same FertilMARQ: Same
Test Temperature	Ambient temperature	Hemocytometer: Same FertilMARQ: Same
Result Reading	Qualitative by visual line	Fertell: Same

<b>Differences</b>		
<b>Item</b>	<b>Device</b>	<b>Predicate</b>
Test Type	Qualitative test	Hemocytometer: Quantitative test
Assay Design	Chromatographic Immunoassay	Hemocytometer: Manual count FertilMARQ: Chemical reaction
Assay Principle	Color label bound to sperm	Manual count
Test Temperature	Ambient temperature	37 <sup>0</sup> C

Differences		
Item	Device	Predicate
Result Reading	Qualitative by visual line	Hemocytometer: Manual count FertilMARQ: Qualitative by visual color
Positive Detection Level	$\geq 250,000$ sperm/mL	Hemocytometer: Any number Fertell: $\geq 10$ M sperm/mL FertilMARQ: $\geq 20$ M sperm/mL
Performance Comparison	96% compared to Hemocytometer	Fertell: Accuracy reported to its predicate: 95.7% FertilMARQ: Reported: Sensitivity: 94% Specificity: 61% Accuracy: 78%

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

WHO Laboratory Manual for the Examination of Human Semen and Sperm-Cervical Mucus Interaction, fourth ed., Cambridge University Press, Cambridge, U.K.

**L. Test Principle:**

SpermCheck Vasectomy test is a rapid qualitative test detecting the presence of sperm in human semen at 250,000 sperm/mL and above. The test employs solid-phase chromatographic immunoassay technology and sperm are detected using antibodies against sperm acrosome-specific protein analyte SP10. This protein is a post meiotic gene product expressed selectively in spermatids. In the test procedure, a semen sample mixed with a test solution is dispensed into the sample well, the sample migrates into the pads containing lyophilized detector antibody that is conjugated to gold dye. If the sample contains sperm, upon hydration by the applied sample, complexes are formed consisting of antibody-dye + antigen (SP10). The complexes and excess hydrated antibodies migrate forward via capillary action on the nitrocellulose membrane. The membrane serves as a solid support upon which capture antibody (test band) and anti-species IgG antibodies (control band) are immobilized. The immobilization of these reagents on the nitrocellulose membrane, in defined areas, allows for the formation of distinct colored bands that can be read visually. The complex of antibody-dye + antigen is captured by antibody on the membrane and a red line appears at the test band on the membrane.

## M. Performance Characteristics (if/when applicable):

### 1. Analytical performance:

#### a. *Precision/Reproducibility:*

The precision study was performed by carrying out the test for two days by three different operators with two lots of devices. The samples were prepared by diluting the pooled normal semen to the appropriate sperm concentrations. The samples were randomly distributed. The tested concentrations were 0, 125,000, 251,000, 353,000, and 706,000 sperm/mL. The results agreed 100% with the expected results. No difference in the performance was found between lots, days, and operators.

#### b. *Linearity/assay reportable range:*

N/A

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

Real time stability testing has been performed. At each test time point, negative, very low positive (approximately the level of sensitivity), and medium positive (2 times the level of sensitivity) controls were tested. At each time point, each sample level was tested in triplicate. Two lots of test devices have been tested and the test results are acceptable up to 16 months at ambient temperature.

#### d. *Detection limit:*

The SpermCheck Vasectomy test was designed to show positive results from samples containing sperm at concentrations at or above the sensitivity limit of 250,000 sperm/mL. Semen samples were collected from normal men and pooled. The initial counting of pooled semen by Hemacytometer was 93.6 million sperm/mL. The semen was diluted with semen from a pool of vasectomized male donors to a sperm concentration of 406,000 sperm/mL. All other concentrations were prepared from this semen sample by serially diluting with pooled semen from vasectomized men. The concentrations prepared were 406,000, 258,000, 129,000, 64,500, and 21,500 sperm/mL. At each concentration the SpermCheck Vasectomy test was repeated 10 times with each lot of devices. Two lots of SpermCheck Vasectomy devices were used for the experiment. Therefore, 20 replicates at each concentration and a total of 120 tests were tested.

Table 1. Sensitivity Study

Sperm Concentration (Sperm/mL)	Percent Positive (N)	Percent Negative (N)
0	0 (20)	100 (20)
21,500	0 (20)	100 (20)
64,500	0 (20)	100 (20)
129,000	0 (20)	100 (20)
258,000	100 (200)	0 (20)
406,000	100 (20)	0 (20)

e. *Analytical specificity:*

The cross reactivity and potential interference of various substances on the SpermCheck Vasectomy test were tested by spiking each substance into the 250,000 sperm/mL semen sample and into the semen from a vasectomized male (no sperm in the semen) to the desired concentration. Each concentration was tested in triplicate. All substances showed no cross-reactivity or interference at the level tested.

Table 2. Substances Tested for Cross Reactivity

Substances	Source and Cat. #	Test Concentration
<i>Escherichia coli</i>	ATCC35218	1 x 10 <sup>6</sup> /mL
<i>Corynebacterium diptheria</i>	ATCC13812	1 x 10 <sup>6</sup> /mL
<i>Neisseria gonorrhoea</i>	ATCC35541	1 x 10 <sup>6</sup> /mL
<i>Chlamydia trachomatis</i>	ATCC VR-880	3.1 x 10 <sup>4</sup> /mL
19-norethindrone acetate	Sigma N-6127	20 µg/mL
Testosterone	Cerilliant T-037	20 µg/mL
β-Estradiol	Sigma E-1132	20 µg/mL
D(-) Norgestrel	Sigma N-2260	20 µg/mL
White Blood Cells	-	1.9 x 10 <sup>9</sup> /mL
Whole Blood	-	10%
Urine	-	10%
Saliva	-	10%

f. Assay cut-off:

N/A

2. Comparison studies:

a. *Method comparison with predicate device:*

A study was designed to test the performance of the SpermCheck Vasectomy test compared to the WHO standard procedure of determining sperm concentration with a Hemacytometer (the predicate device). SpermCheck Vasectomy is a semi-quantitative test that reports samples as containing sperm concentrations above or below 250,000 sperm/mL. The study was performed at two clinical sites by professional laboratory personnel. A total of 145 semen samples were tested, however one test result was excluded from the analysis since the result was not read at the correct reading time given in the test protocol. Since the detection level of SpermCheck Vasectomy is 250,000 sperm/mL, the data comparison was made with this concentration as a decision level between positive and negative.

Table 3. SpermCheck Vasectomy vs. Hemacytometer

		SpermCheck Vasectomy		Total
		Positive	Negative	
Hemacytometer	Positive	37	3	40
	Negative	3	101	104
Total		40	104	144

Negative Predictive Value: 0.971

Positive Predictive Value: 0.925

Sensitivity: 93%

Specificity: 97%

Accuracy: 96%

b. *Matrix comparison:*

N/A

3. Clinical studies:

a. *Clinical Sensitivity:*

N/A

b. *Clinical specificity:*

N/A

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

I. A consumer use study was conducted to determine the test performance when used by unassisted lay users following the instructions in the package insert. The study was conducted in two ways: 1) Performance of the consumer at home with his own semen sample; 2) Performance of the consumer with provided semen samples. The minimum target number was 50 people for each study.

In the study of the consumer at home with his own semen sample 51 subjects were enrolled with 31 who had been vasectomized and 20 who had not. Laboratory personnel performed a hemacytometer count on unused sample returned to the lab by the consumer. There was 100% agreement between the SpermCheck Vasectomy results obtained by the home users and those obtained by laboratory personnel retesting the same semen samples. For the method comparison, there was 98% agreement between the SpermCheck Vasectomy results and the hemacytometer counts with one disagreement among the 50 tests.

In the study of consumers provided with semen samples 59 people (49 male and 10 female) participated. All results showed 100% agreement.

Table 4. Consumer Performance with Provided Semen Samples

<b>Sample ID</b>	<b>Concentration Sperm/mL</b>	<b>Negative</b>	<b>Positive</b>	<b>Invalid</b>	<b>Total</b>	<b>% Correct</b>
A	350,000	0	59	0	59	100
B	17,000	59	0	0	59	100
C	1,000,000	0	59	0	59	100
Total		59	118	0	177	100

II. A High Dose Hook Effect study was conducted to assess whether the Sperm Check Vasectomy test would give false negative results with very high concentrations of sperm due to the hook effect, and semen samples of various sperm concentrations of up to 253 million sperm/mL were tested. The results were read by an optical density reader. The signal intensity increased as the sperm concentration increased and no signal reduction was observed. In a separate study, a clinical sample with a sperm concentration of 387 million sperm/mL was tested and the test result showed a very strong positive signal. A false negative result due to the hook effect was not observed with this very high sperm concentration.

4. Clinical cut-off:

N/A

5. Expected values/Reference range:

N/A

**N. Proposed Labeling:**

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

**O. Conclusion:**

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

**P. Other Supportive Device and Instrument Information:**

N/A