October 29, 2018

PixCell Medical Technologies, Ltd.
% Erika Ammirati
Regulatory Consultant
Erika B. Ammirati, RAC, MT (ASCP)
575 Shirlynn Court
Los Altos, California 94022

Re: K180020
Trade/Device Name: HemoScreen Hematology Analyzer
Regulation Number: 21 CFR 864.5220
Regulation Name: Automated differential cell counter
Regulatory Class: Class II
Product Code: GKZ
Dated: December 28, 2017
Received: January 2, 2018

Dear Erika Ammirati:

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. Although this letter refers to your product as a device, please be aware that some cleared products may instead be combination products. The 510(k) Premarket Notification Database located at https://www.accessdata.fda.gov/scripts/cdrh/cfdocs/cfpmn/pmn.cfm identifies combination product submissions. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. Please note: CDRH does not evaluate information related to contract liability warranties. We remind you, however, that device labeling must be truthful and not misleading.

If your device is classified (see above) into either class II (Special Controls) or class III (PMA), it may be subject to additional controls. Existing major regulations affecting your device can be found in the Code of Federal Regulations, Title 21, Parts 800 to 898. In addition, FDA may publish further announcements concerning your device in the Federal Register.

Please be advised that FDA's issuance of a substantial equivalence determination does not mean that FDA has made a determination that your device complies with other requirements of the Act or any Federal

statutes and regulations administered by other Federal agencies. You must comply with all the Act's requirements, including, but not limited to: registration and listing (21 CFR Part 807); labeling (21 CFR Part 801 and Part 809); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803) for devices or postmarketing safety reporting (21 CFR 4, Subpart B) for combination products (see https://www.fda.gov/CombinationProducts/GuidanceRegulatoryInformation/ucm597488.htm); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820) for devices or current good manufacturing practices (21 CFR 4, Subpart A) for combination products; and, if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21 CFR Part 807.97). For questions regarding the reporting of adverse events under the MDR regulation (21 CFR Part 803), please go to http://www.fda.gov/MedicalDevices/Safety/ReportaProblem/default.htm.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/MedicalDevices/DeviceRegulationandGuidance/) and CDRH Learn (http://www.fda.gov/Training/CDRHLearn). Additionally, you may contact the Division of Industry and Consumer Education (DICE) to ask a question about a specific regulatory topic. See the DICE website (http://www.fda.gov/DICE) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Leonthena R. Carrington -S

Lea Carrington
Director
Division of Immunology
and Hematology Devices
Office of In Vitro Diagnostics
and Radiological Health
Center for Devices and Radiological Health

Enclosure

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: 06/30/2020
See PRA Statement below.

510(k) Number *(if known)*

Device Name
HemoScreen Hematology Analyzer

Indications for Use *(Describe)*

The HemoScreen is a point-of-care (POC) automated hematology analyzer intended for the enumeration and classification of the following parameters in capillary and venous whole blood (K2EDTA anticoagulated): WBC, RBC, HGB, HCT, MCV, MCH, MCHC, RDW, PLT, MPV, NEUT%, NEUT#, LYMP%, LYMP#, MONO%, MONO#, EO%, EO#, BASO %, and BASO#. The HemoScreen is for in vitro diagnostic use in clinical laboratories and/or POC settings for adults and children at least 2 years of age.

Type of Use *(Select one or both, as applicable)*

☒ Prescription Use (Part 21 CFR 801 Subpart D) ☐ Over-The-Counter Use (21 CFR 801 Subpart C)

CONTINUE ON A SEPARATE PAGE IF NEEDED.

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510(k) SUMMARY

This summary of 510(k) safety and effectiveness information is being submitted in accordance with the requirements of SMDA 1990 and 21 CFR 807.92. The assigned 510(k) number is K180020.

807.92 (a)(1): Name: PixCell Medical Technologies, Ltd.
Address: 6 Hayezira St.
Yoknaem Ilit, Israel 2069202
Phone: +972-4-9593516
Email: yaara@pixcell-medical.com
Contact: Yaara Ben-Yosef, PhD

807.92 (a)(2): Device name- trade name and common name, and classification

Trade name: HemoScreen Hematology Analyzer

Common Name: Automated differential cell counter

Classification: 21 CFR 864.5220

807.92 (a)(3): Identification of the legally marketed predicate devices

Sysmex XN Series (Sysmex America, Inc, Lincolnshire, IL), cleared under K112605

807.92 (a)(4): Device Description

HemoScreen is a point of care (POC), automated hematology analyzer that provides 20 common CBC parameters, including a 5-part leukocyte (WBC) differential, in capillary and venous whole blood samples. The HemoScreen analyzer (reader) is a tabletop device that is designed to use with a disposable reagent cartridge. In addition to the cartridge, the system includes a disposable sampler with two glass capillaries which is used to collect the blood sample and then transfer it to the cartridge.

Once the cartridge is inserted into the reader, there are no further procedural steps; blood is expelled from the capillaries (sampler) into the reagent compartments (cartridge). The reader then mixes the blood sample with the reagents by alternately pressing compressible portions of the cartridge, eventually causing the suspension of cells to flow into the microfluidic chamber. Cells flowing in the microfluidic chamber focus into a single-cell plane due to a patented physical phenomenon known as viscoelastic focusing.

The reader then captures images of the focused cells and analyzes them in real time using machine vision algorithms. When analysis is complete, the results are displayed to the user on the reader's touch screen and may be printed to an adjacent printer or exported to a USB flash drive. The cartridge is ejected by the analyzer after analysis, and can then be safely disposed of, as the reagents and blood sample remain within the cartridge.

The basic staining and microscopic image analysis performed by HemoScreen closely resembles the traditional blood smear and the hemocytometer counting chamber. Leukocytes are classified based on their staining properties and morphology, whereas absolute counts are obtained by counting the cells contained in a chamber of predetermined volume. Test results are obtained within six (6) minutes and the results are saved.

Quality Control: Commercial 3-level liquid quality controls, PIX-CBC Hematology Controls, are recommended for use with the HemoScreen. These controls cover all the tested parameters and are sampled the same way whole blood is sampled.

Software: The HemoScreen software displays an intuitive, simple-to-use user interface that is operated via the touch screen. The software is responsible for operating the device, performing the measurements, and recording the results.

807.92 (a)(5): Intended Use

The HemoScreen is a point-of-care (POC) automated hematology analyzer intended for the enumeration and classification of the following parameters in capillary and venous whole blood (K_2EDTA anticoagulated): WBC, RBC, HGB, HCT, MCV, MCH, MCHC, RDW, PLT, MPV, NEUT%, NEUT#, LYMP%, LYMP#, MONO%, MONO#, EO%, EO#, BASO%, and BASO#. The HemoScreen is for in vitro diagnostic use in clinical laboratories and/or POC settings for adults and children at least 2 years of age.

807.92 (a)(6): Technological Similarities and Differences to the Predicate

The following chart describes similarities and differences between HemoScreen and the predicate.

Comparison	HemoScreen	Sysmex XN-Series (K112605)
Intended Use	Automated hematology analyzer	Same
Parameters Measured	• Red Blood Cells (RBC), • White Blood Cells (WBC), • Platelets (PLT), • Hemoglobin (HGB), • Hematocrit (HCT), • Mean Corpuscular (erythrocyte) Volume (MCV), • Mean Cell (erythrocyte) Hemoglobin (MCH), • Mean Cell (erythrocyte) Hemoglobin Concentration (MCHC), • Red Blood Cell Distribution Width (RDW)-CV • Mean Platelets Volume (MPV), • Neutrophils (NEUT; #/%),	• Red Blood Cells (RBC), • White Blood Cells (WBC), • Platelets (PLT), • Hemoglobin (HGB), • Hematocrit (HCT), • Mean Corpuscular (erythrocyte) Volume (MCV), • Mean Cell (erythrocyte) Hemoglobin (MCH), • Mean Cell (erythrocyte) Hemoglobin Concentration (MCHC), • Red Blood Cell Distribution Width (RDW)-CV/SD • Mean Platelets Volume (MPV), • Neutrophils (NEUT; #/%), • Monocytes (MONO; #/%),

Comparison	HemoScreen	Sysmex XN-Series (K112605)
	• Monocytes (MONO; #/%), • Lymphocytes (LYMP; #/%), • Eosinophils (EO; #/%) and • Basophiles (BASO; #/%)	• Lymphocytes (LYMP; #/%), • Eosinophils (EO; #/%) and • Basophiles (BASO; #/%) • IG%/#, • NRBC#/%, • RET%/#, • IPF, IRF, • RET-He, • WBC-BF, (Body fluids) • RBC-BF, (Body fluids) • MN%/#, (Body fluids) • PMN%/#, (Body fluids) • TC-BF (Body fluids)
Class	Class II	Same
Regulation Number	21 CFR 864.5220	Same
Product Code	GKZ	Same
FDA Branch	Hematology	Same
Throughput	10 samples/hour	100 samples/hour maximum depending on mode used
Test Principle	The HemoScreen uses a novel focusing method called viscoelastic focusing which causes the cells to perfectly align into a plane. High resolution microscopic images are taken of the flowing cells. Each image is analyzed using machine vision algorithms and the different cell types are differentiated and counted. WBCs are stained prior to analysis so as to enable differentiation between their subtypes and abnormal cells. HGB is calculated based on the optical density measured on intact individual cells.	The XN Series performs analyses using the following methods: fluorescence flow cytometry and sheath flow DC detection. The first is used to differentiate between WBC types and abnormal cells while the second is used for RBC and PLT analysis. The HGB is measured using a standard photometric method on the lysed RBC solution which is reacted with SLS forming a colored SLS-HGB complex.
Calibration	Factory calibrated	Requires operator calibrations
Sample Type	Anticoagulated whole blood	Same
Sample Volume	40µL	88 µL

807.92 (b)(1): Brief Description of Nonclinical Data

Limit of Blank- (Reference CLSI EP17-A2 and CLSI H26-A2)

Five residual normal venous blood samples (from both morphological and cell distribution aspects) were centrifuged to deplete the plasma supernatant of RBCs, WBCs and PLTs. These processed samples were separated to clean neutral tubes with no additives and were assayed six times on two HemoScreen devices for a total of 60 measurements per parameter, using three cartridge and sampler batches. The parameters under evaluation were WBC, RBC, HGB, HCT and PLT.

The limit of blank was determined by the 95th percentile of the distribution of the study variable, and the data are summarized below for all five parameters of interest.

Summary Limit of Blank for WBC, RBC, HGB, HCT and PLT for the HemoScreen

Parameter	LoB
WBC	0.0 x 10^3/µL
RBC	0.0 x 10^6/µL
HGB	0.0 g/dL
HCT	0.0 %
PLT	0.0 x 10^3/µL

Limits of Detection and Quantitation

For the LoDs and LoQs, five residual blood samples were processed to low target concentration, and measured by the comparative method. Each of the processed samples was assayed six times on each of the two HemoScreen devices (5 x 6 x 2 = 60 runs) using six cartridge batches and eight sampler batches. The LoDs were determined mathematically both from the LoBs and by HemoScreen testing.

The LoQs were defined as the lowest concentration in which pre-determined total error (TE) accuracy goals, as compared to the laboratory reference method, were satisfied. All TE goals were met (TEs were less than the goals), and the LoD and LoQ for the five parameters are shown below.

LoD and LoQ Summaries

Parameter	Units	LoD	LoQ
WBC	x 10^3/µL	0.20	0.51
RBC	x 10^6/µL	0.03	0.65
HGB	g/dL	0.11	1.87
HCT	%	0.28	5.66
PLT	x 10^3/µL	4.57	4.57

Linearity (CLSI H26-A2 and CLSI EP6-A)

Six venous whole blood samples, with their respective results measured by the laboratory reference method, were manipulated to create the linearity panels for WBC, RBC, HGB, HCT, and PLT.

Seven concentrations were used for RBC, HGB and HCT, 10 concentrations were used for PLT, and 14 concentrations were used for WBC. Each concentration level was tested in duplicate on each of two HemoScreen analyzers. Scatter plots with linear fit (with 95% confidence intervals) of the observed value (Y =values measured on the HemoScreen) versus the expected value (X =calculated from the highest concentration of the HemoScreen result) were created. The HS data were evaluated for linearity by fitting a linear regression model and two polynomial regression models (quadratic and cubic) to the measurements. The linearity ranges are shown below.

Analytical Measurement Interval (AMI) Ranges

Measurand	Final AMI
WBC (10^3/µL)	0.5-80.0
RBC (10^6/µL)	1.0-8.8
HGB (g/dL)	3.0-25.0
HCT (%)	9.0-78.0
PLT (10^3/µL)	20-800

Repeatability (internal and external operators)

The short-term precision (repeatability) study was conducted in two parts; Part A evaluatedshort-term HemoScreen precision using normal and pathological fresh whole blood samples when testing was performed by PixCell employees (at a single external site); Part B evaluated short-term HemoScreen precision with the same sample types, but testing was performed across three clinical sites by external operators.

For the internal operators, a total of 14 venous whole blood specimens were tested 15 times by HemoScreen, including five samples that spanned the normal ranges, and nine samples with values outside the normal ranges for at least one of the following parameters: WBC, RBC, HGB, HCT, or PLT. The data was analyzed as instructed in CLSI EP05-A3.

Short-term Precision with Internal Operators

Parameter	Target Range (conventional units)	Mean (conventional units)	Repeatability (SD)	CV
WBC	0.5-4.0	2.79	**0.138**	**4.9%**
WBC	>4.0-80.0	12.60	**0.504**	**4.0%**
RBC	1.0-3.5	3.22	**0.038**	**1.2%**
RBC	>3.5-8.0	4.98	**0.073**	**1.5%**
HGB	5-11	8.52	**0.186**	**2.2%**
HGB	>11-25	13.73	**0.219**	**1.6%**
HCT	10-70	40.79	**0.639**	**1.6%**
MCV	50-150	82.43	**0.413**	**0.5%**
MCH	10-45	26.49	**0.221**	**0.8%**
MCHC	26-38	31.89	**0.311**	**1.0%**
RDW	10-40	14.98	**0.037**	**0.2%**
PLT	20-150	116.07	**3.277**	**2.8%**
PLT	>150-800	270.88	**9.371**	**3.5%**
MPV	7-25	10.75	**0.172**	**1.6%**
NEU#	WBC≤4.0x10^3/µL	1.31	**0.077**	**5.8%**
NEU#	WBC>4.0x10^3/µL	5.57	**0.350**	**6.3%**
LYM#	WBC≤4.0x10^3/µL	0.98	**0.078**	**8.0%**
LYM#	WBC>4.0x10^3/µL	5.92	**0.300**	**5.1%**
MON#	WBC≤4.0x10^3/µL	0.34	**0.060**	**17.8%**
MON#	WBC>4.0x10^3/µL	0.86	**0.135**	**15.7%**
EOS#	WBC≤4.0x10^3/µL	0.10	**0.025**	**23.9%**
EOS#	WBC>4.0x10^3/µL	0.25	**0.033**	**13.5%**
BAS#	WBC≤4.0x10^3/µL	0.00	**0.005**	**NA**
BAS#	WBC>4.0x10^3/µL	0.02	**0.011**	**NA**
NEU%	WBC≤4.0x10^3/µL	48.82	**2.418**	**5.0%**
NEU%	WBC>4.0x10^3/µL	50.01	**1.900**	**3.8%**
LYM%	WBC≤4.0x10^3/µL	36.39	**2.235**	**6.1%**
LYM%	WBC>4.0x10^3/µL	39.61	**1.385**	**3.5%**
MON%	WBC≤4.0x10^3/µL	11.52	**1.970**	**17.1%**
MON%	WBC>4.0x10^3/µL	9.93	**1.353**	**13.6%**
EOS%	WBC≤4.0x10^3/µL	3.60	**0.888**	**24.7%**
EOS%	WBC>4.0x10^3/µL	2.25	**0.427**	**19.0%**
BAS%	WBC≤4.0x10^3/µL	0.17	**0.198**	**NA**
BAS%	WBC>4.0x10^3/µL	0.21	**0.142**	**NA**

For the testing with external operators, a minimum of 12 blood samples per site were assayed 15 times and all 20 parameters were measured. A minimum of two HemoScreen analyzers were used at each site, and samples were assayed by at least two operators per site. The operators' job descriptions resembled those of the intended user profile in POC settings, and therefore included phlebotomists, laboratory assistants, nurses, and medical assistants.

The blood samples at each site were selected based on their results obtained by the laboratory reference method. Sample selection was based on covering the analytical measurement ranges (AMRs), and the inclusion of medical decision points for WBC, RBC, HGB, HCT and PLT, with balanced distributions.

Short-term Precision with External Operators

Parameter	Target Range (conventional units)	Mean (conventional units)	SD	CV
WBC	0.5-4.0	2.84	0.259	9.1%
WBC	4.0-80.0	11.60	0.514	4.4%
RBC	1.0-3.5	2.95	0.084	2.8%
RBC	3.5-8.0	4.83	0.104	2.2%
HGB	5-11	9.18	0.265	2.9%
HGB	11-25	14.54	0.322	2.2%
HCT	10-70	36.08	0.847	2.3%
MCV	50-150	87.87	0.397	0.5%
MCH	10-45	28.86	0.264	0.9%
MCHC	26-38	32.81	0.339	1.0%
RDW	10-40	16.05	0.076	0.5%
PLT	20-150	84.60	6.033	7.1%
PLT	>150-800	317.32	11.067	3.5%
MPV	7-25	11.22	0.213	1.9%
NEU#	WBC≤4.0x10^3/µL	1.81	0.182	10.1%
NEU#	WBC>4.0x10^3/µL	7.08	0.373	5.3%
LYM#	WBC≤4.0x10^3/µL	0.69	0.095	13.7%
LYM#	WBC>4.0x10^3/µL	3.49	0.277	7.9%
MON#	WBC≤4.0x10^3/µL	0.26	0.056	21.3%
MON#	WBC>4.0x10^3/µL	0.71	0.154	21.6%
EOS#	WBC≤4.0x10^3/µL	0.06	0.019	31.9%
EOS#	WBC>4.0x10^3/µL	0.30	0.047	15.5%
BAS#	WBC≤4.0x10^3/µL	0.01	0.006	NA
BAS#	WBC>4.0x10^3/µL	0.01	0.009	NA
NEU%	WBC≤4.0x10^3/µL	62.07	2.551	4.1%
NEU%	WBC>4.0x10^3/µL	63.20	2.102	3.3%
LYM%	WBC≤4.0x10^3/µL	26.22	2.112	8.1%
LYM%	WBC>4.0x10^3/µL	25.98	1.340	5.2%
MON%	WBC≤4.0x10^3/µL	9.37	1.866	19.9%
MON%	WBC>4.0x10^3/µL	7.59	1.442	19.0%
EOS%	WBC≤4.0x10^3/µL	2.06	0.684	33.2%
EOS%	WBC>4.0x10^3/µL	3.09	0.482	15.6%
BAS%	WBC≤4.0x10^3/µL	0.28	0.263	NA
BAS%	WBC>4.0x10^3/µL	0.14	0.106	NA

The all-sites data indicated that the predefined acceptance criteria were met for all the 20 measurands and in all tested ranges. Additionally, there were no distinct differences in performance observed among sites. Moreover, external operator precision testing demonstrated performance that is in-line with the performance that was shown when testing was done by PixCell employees.

Reproducibility (CLSI EP05-A3 and H26-A2)

The study was conducted at each of three sites for a total of 5 days, during which time all 20 measurands were assayed using a 3-level control set comprising low, normal and high levels of measurands. Each site utilized different analyzers and batches of cartridges and samplers, and the same lot of controls. The tests were performed as follows: one run per day, with five replicates per run, for a total of 25 measurements per site and level. The total number of measurements for each measurand was 225. To further demonstrate precision performance SD and %CV of within-day, between-day, between-site and overall reproducibility were calculated per site and for the combined sites, as shown below.

Reproducibility for the Combined Sites

Parameter	Level	Mean	Within-Day (Repeatability)		Between-Day		Between-Site		Overall Reproducibility	
			SD	CV%	SD	CV%	SD	CV%	SD	CV%
WBC	Low	2.82	0.203	7.2%	0.000	0.0%	0.116	4.1%	0.234	8.3%
WBC	Normal	8.98	0.424	4.7%	0.078	0.9%	0.234	2.6%	0.490	5.5%
WBC	High	20.62	0.802	3.9%	0.219	1.1%	0.355	1.7%	0.904	4.4%
RBC	Low	2.66	0.052	1.9%	0.011	0.4%	0.040	1.5%	0.066	2.5%
RBC	Normal	4.93	0.096	1.9%	0.016	0.3%	0.065	1.3%	0.117	2.4%
RBC	High	5.92	0.108	1.8%	0.020	0.3%	0.038	0.6%	0.116	2.0%
HGB	Low	7.01	0.168	2.4%	0.049	0.7%	0.045	0.6%	0.181	2.6%
HGB	Normal	15.48	0.430	2.8%	0.078	0.5%	0.075	0.5%	0.444	2.9%
HGB	High	22.04	0.469	2.1%	0.076	0.3%	0.073	0.3%	0.481	2.2%
HCT	Low	19.01	0.376	2.0%	0.073	0.4%	0.340	1.8%	0.512	2.7%
HCT	Normal	40.48	0.819	2.0%	0.080	0.2%	0.567	1.4%	0.999	2.5%
HCT	High	57.32	1.077	1.9%	0.214	0.4%	0.334	0.6%	1.148	2.0%
MCV	Low	71.42	0.438	0.6%	0.000	0.0%	0.506	0.7%	0.669	0.9%
MCV	Normal	82.19	0.526	0.6%	0.000	0.0%	0.273	0.3%	0.593	0.7%
MCV	High	96.90	0.486	0.5%	0.116	0.1%	0.280	0.3%	0.573	0.6%
MCH	Low	26.32	0.465	1.8%	0.000	0.0%	0.218	0.8%	0.513	1.9%
MCH	Normal	31.43	0.442	1.4%	0.084	0.3%	0.198	0.6%	0.492	1.6%
MCH	High	37.26	0.402	1.1%	0.070	0.2%	0.319	0.9%	0.518	1.4%
MCHC	Low	36.86	0.764	2.1%	0.023	0.1%	0.502	1.4%	0.915	2.5%
MCHC	Normal	38.24	0.648	1.7%	0.111	0.3%	0.312	0.8%	0.727	1.9%
MCHC	High	38.46	0.491	1.3%	0.125	0.3%	0.379	1.0%	0.633	1.6%
RDW	Low	13.80	0.114	0.8%	0.000	0.0%	0.112	0.8%	0.160	1.2%
RDW	Normal	16.57	0.072	0.4%	0.000	0.0%	0.129	0.8%	0.148	0.9%
RDW	High	13.79	0.193	1.4%	0.097	0.7%	0.180	1.3%	0.281	2.0%
PLT	Low	70.71	3.408	4.8%	1.329	1.9%	4.222	6.0%	5.586	7.9%
PLT	Normal	269.42	9.208	3.4%	3.300	1.2%	11.328	4.2%	14.967	5.6%
PLT	High	567.99	17.348	3.1%	2.958	0.5%	14.760	2.6%	22.969	4.0%
MPV	Low	9.91	0.084	0.8%	0.000	0.0%	0.057	0.6%	0.101	1.0%
MPV	Normal	9.82	0.069	0.7%	0.014	0.1%	0.051	0.5%	0.087	0.9%
MPV	High	9.98	0.062	0.6%	0.004	0.0%	0.051	0.5%	0.080	0.8%
NEU#	Low	1.48	0.120	8.1%	0.010	0.7%	0.043	2.9%	0.128	8.6%
NEU#	Normal	4.44	0.221	5.0%	0.000	0.0%	0.000	0.0%	0.221	5.0%
NEU#	High	9.17	0.544	5.9%	0.107	1.2%	0.532	5.8%	0.768	8.4%
LYM#	Low	0.97	0.094	9.6%	0.000	0.0%	0.070	7.2%	0.117	12.0%
LYM#	Normal	3.34	0.211	6.3%	0.098	2.9%	0.232	7.0%	0.329	9.8%
LYM#	High	9.02	0.640	7.1%	0.150	1.7%	0.737	8.2%	0.987	10.9%
MON#	Low	0.25	0.040	15.6%	0.012	4.7%	0.000	0.0%	0.042	16.3%

Parameter	Level	Mean	Within-Day		Between-Day		Between-Site		Overall Reproducibility	
			SD	CV%	SD	CV%	SD	CV%	SD	CV%
MON#	Normal	0.86	0.078	9.1%	0.000	0.0%	0.013	1.5%	0.079	9.2%
MON#	High	1.66	0.126	7.6%	0.000	0.0%	0.025	1.5%	0.129	7.8%
EOS#	Low	0.10	0.020	21.2%	0.000	0.0%	0.000	0.0%	0.020	21.2%
EOS#	Normal	0.30	0.041	13.7%	0.000	0.0%	0.007	2.4%	0.042	13.9%
EOS#	High	0.69	0.059	8.5%	0.000	0.0%	0.012	1.8%	0.060	8.7%
BAS#	Low	0.01	0.002	NA	0.000	NA	0.001	NA	0.002	NA
BAS#	Normal	0.04	0.004	NA	0.000	NA	0.002	NA	0.004	NA
BAS#	High	0.09	0.005	NA	0.001	NA	0.002	NA	0.006	NA
NEU%	Low	52.57	2.002	3.8%	0.000	0.0%	0.419	0.8%	2.046	3.9%
NEU%	Normal	49.49	1.340	2.7%	0.443	0.9%	1.388	2.8%	1.979	4.0%
NEU%	High	44.48	2.313	5.2%	0.240	0.5%	2.893	6.5%	3.712	8.3%
LYM%	Low	34.55	2.022	5.9%	0.357	1.0%	1.000	2.9%	2.284	6.6%
LYM%	Normal	37.16	1.237	3.3%	0.641	1.7%	1.584	4.3%	2.109	5.7%
LYM%	High	43.73	2.421	5.5%	0.383	0.9%	3.017	6.9%	3.888	8.9%
MON%	Low	9.04	1.276	14.1%	0.383	4.2%	0.259	2.9%	1.357	15.0%
MON%	Normal	9.56	0.777	8.1%	0.120	1.3%	0.273	2.9%	0.832	8.7%
MON%	High	8.05	0.458	5.7%	0.000	0.0%	0.102	1.3%	0.469	5.8%
EOS%	Low	3.42	0.698	20.4%	0.000	0.0%	0.025	0.7%	0.699	20.4%
EOS%	Normal	3.37	0.438	13.0%	0.000	0.0%	0.000	0.0%	0.438	13.0%
EOS%	High	3.33	0.249	7.5%	0.000	0.0%	0.120	3.6%	0.276	8.3%
BAS%	Low	0.42	0.052	NA	0.011	NA	0.000	NA	0.053	NA
BAS%	Normal	0.42	0.038	NA	0.000	NA	0.005	NA	0.039	NA
BAS%	High	0.41	0.021	NA	0.000	NA	0.001	NA	0.021	NA

Interference- (CLSI EP7-A2 and CLSI H26-A2)

To evaluate potential interferences, high levels of bilirubin (conjugated), triglycerides, WBCs, PLT and NRBCs were tested by the HemoScreen system according to CLSI EP07-A2.

Blood samples were acquired as follows:

- Lipemia- 11 blood sample remnants with triglyceride concentration greater than 300 mg/dL.
- Bilirubin- 3 blood samples with initial total blood volume of more than 3 mL were manipulated with exogenous bilirubin to target the desired bilirubin levels.
- Leukocytosis, thrombocytosis, and NRBC flagged samples were chosen according to established criteria. The sample set included nine blood samples with high WBC levels (>50x10^3/µL), eight blood samples with high PLT levels (>700x10^3/µL), and nine samples which flagged NRBC by the laboratory reference method.

For lipemia, all measurands were analyzed. For bilirubin, the following 10 measurands were analyzed: WBC, RBC, HGB, HCT, MCV, MCH, MCHC, RDW, PLT and MPV. For leukocytosis, RBC, HGB, MCV and PLT were analyzed. For thrombocytosis, WBC, RBC, HGB, PLT and MPV were analyzed. For NRBC flagged samples, WBC and the differentials were analyzed.

For all evaluations except bilirubin, samples were tested in duplicate or triplicate by HemoScreen and by a reference device (in singleton or in duplicate) that reports no interference from these substances (control group results). The averaged HemoScreen results were compared to the average of duplicate results (or the single result) from the control group and analyzed by paired difference testing. For bilirubin, only HemoScreen testing was performed, where the "spiked results" were compared to results from testing with neat samples (no exogenous bilirubin added). Again, the results were analyzed by paired difference testing.

There was no significant bilirubin interference up to a concentration 50 mg/dL for the following parameters: WBC, HGB, RBC, HCT, MCV, MCH, MCHC, and RDW. There was no significant bilirubin interference up to a concentration of 30 mg/dL for PLT and MPV. No interference was identified from high triglyceride levels (319-729 mg/dL), and no interference was noted from high levels of WBC (up to 317x10^3/µL), PLT (up to 2,045x10^3/µL), or NRBCs.

Whole Blood Stability

Eighteen (18) freshly collected venous whole blood samples were collected from volunteer subjects. The venous blood samples were collected into K_2EDTA tubes. Efforts were made to collect samples that spanned as wide a range as possible for the WBC, RBC, HGB, HCT, and PLT parameters.

Each blood sample was measured in duplicate with results averaged to obtain the baseline at time zero (T0). The samples were subsequently kept at RT (22^0-25^0C) and were analyzed again, in duplicate (with results averaged), at the following time points: 2 hours, 4 hours, 6 hours, 7 hours and 8 hours. The ratio of T(x) to T0 was calculated and averaged for all blood samples for each parameter and each time point.

The results confirmed that performance at all time points, and for all parameters, met the acceptance criteria. Therefore, the data validated that venous blood samples stored at room

temperature can be analyzed on the HemoScreen for seven (7) hours from the time of blood collection without compromising the performance characteristics.

807.92 (b)(2): Brief Description of Clinical Data

Method Comparison & Clinical Sensitivity/Specificity

The objective of the study was to evaluate the comparability and clinical sensitivity of the HemoScreen analyzer. A total of 495 normal and pathological residual whole blood specimens were collected across three clinical sites. Different HemoScreen devices and cartridge/sampler batches were used by several operators at each site. Each of the samples was analyzed twice on the HemoScreen (first usable replicate result used for data analyses) by operators who resembled the intended users in terms of education and experience, and twice on the predicate by laboratory personnel (the comparative results were averaged for data analyses). Three blood film slides were prepared for each sample for measurement by an automated blood smear (differential) method (2 slides/200 cells counted per slide for a total of 400 cell differential according to CLSI H20-A2). Experienced operators trained to use the automated blood smear performed the differentials, including morphology evaluation, and the results were verified by these operators.

Correlation and Bias of HemoScreen Compared to Standard Method and Blood Smears – Combined Sites (excluding flagged parameters)

Parameter	Comparator	Pearson Correlation Coefficient (r)	Intercept	Lower 95% CL	Upper 95% CL	Slope	Lower 95% CL	Upper 95% CL	Mean Bias	Mean Relative Bias
WBC (x 10^3/µL)	**Sysmex**	0.993	-0.256	-0.396	-0.116	1.040	1.019	1.061	0.09	-0.14%
RBC (x 10^6/µL)	**Sysmex**	0.989	0.021	-0.047	0.088	1.000	0.983	1.016	0.02	0.52%
HGB (g/dL)	**Sysmex**	0.985	-0.334	-0.549	-0.119	1.038	1.019	1.056	0.13	0.81%
HCT (%)	**Sysmex**	0.982	-0.184	-0.872	0.505	1.036	1.017	1.056	1.15	3.05%
MCV (fL)	**Sysmex**	0.956	-2.367	-6.216	1.482	1.053	1.009	1.096	2.27	2.53%
MCH (pg)	**Sysmex**	0.957	0.131	-0.560	0.822	0.998	0.974	1.021	0.06	0.20%
MCHC (g/dL)	**Sysmex**	0.675	8.309	5.921	10.697	0.727	0.655	0.799	-0.78	-2.34%
RDW (%)	**Sysmex**	0.946	0.504	-0.018	1.025	0.965	0.928	1.002	-0.03	-0.12%
PLT (x 10^3/µL)	**Sysmex**	0.967	-6.581	-10.494	-2.668	1.093	1.068	1.118	14.57	5.12%
MPV (fL)	**Sysmex**	0.831	0.043	-0.660	0.745	1.016	0.949	1.082	0.21	1.93%
NEU (x 10^3/µL)	**Sysmex**	0.989	0.026	-0.069	0.120	1.032	1.007	1.057	0.22	3.83%
LYM (x 10^3/µL)	**Sysmex**	0.997	-0.003	-0.037	0.032	1.058	1.035	1.082	0.12	5.46%
MON (x 10^3/µL)	**Sysmex**	0.718	-0.014	-0.077	0.049	0.781	0.671	0.892	-0.16	-27.08%
EOS (x 10^3/µL)	**Sysmex**	0.981	-0.002	-0.007	0.003	0.984	0.915	1.053	-0.00	-4.33%
BAS (x 10^3/µL)*	**Sysmex**	NA	NA	NA	NA	NA	NA	NA	NA	NA
NEU (%)	**Sysmex**	0.984	2.161	1.182	3.139	0.996	0.978	1.014	1.90	3.71%
	Blood Smear	0.960	-0.125	-2.045	1.795	1.000	0.967	1.033	-0.30	-0.23%
LYM (%)	**Sysmex**	0.991	0.411	-0.011	0.833	1.029	1.007	1.051	0.96	5.11%
	Blood Smear	0.961	1.173	0.806	1.541	1.016	0.988	1.045	1.01	8.45%
MON (%)	**Sysmex**	0.780	-0.370	-1.271	0.531	0.809	0.693	0.924	-1.87	-26.90%
	Blood Smear	0.594	0.159	-0.316	0.634	0.944	0.851	1.038	-0.17	-2.41%
EOS (%)	**Sysmex**	0.981	0.005	-0.002	0.013	0.949	0.893	1.006	-0.06	-2.97%
	Blood Smear	0.943	0.009	-0.031	0.049	1.170	1.045	1.296	0.13	16.01%
BAS (%)*	**Sysmex**	NA	NA	NA	NA	NA	NA	NA	NA	NA
	Blood Smear	NA	NA	NA	NA	NA	NA	NA	NA	NA

For all parameters, for both comparators, and for all values with or without flagged results, the 95% confidence intervals for mean bias / mean relative bias were within the acceptance limits.

For MON# and MON%, the point estimate of the correlation between the HemoScreen and the Sysmex met the acceptance limit when

flagged results were excluded. For the rest of parameters, against all comparators, and for all results, with and without flags, the correlation point estimates met the acceptance criteria.

*NOTE: Basophil data are not provided in the previous table, as the distribution of samples with low-to-high levels of basophils was not achieved and the data were not meaningful. Therefore, in a separate study that focused on basophils only, 95 whole blood samples that included high levels of basophils were analyzed by HemoScreen and by light microscopy. The table below describes the percentages of various basophil levels in each study.

		BAS>1%	**BAS>2%**	**BAS>3%**	**BAS>4%**
Clinical studies N = 495	Blood smear	15.73%	3.73%	1.04%	0.21%
BASO study N = 95	Blood smear	31.52%	15.22%	6.52%	3.26%

The data from the "BASO Study" were analyzed using light microscopy (the standard reference method) to determine %basophils, and the Sysmex method to determine absolute counts. This dual process was required as the blood smear method does not provide counts. The data are as follows:

Correlation and Bias of HemoScreen Compared to Standard Method and Blood Smears (Basophils)

Parameter	**Comparator**	**Pearson Correlation Coefficient (r)**	**Intercept**	**Lower 95% CL**	**Upper 95% CL**	**Slope**	**Lower 95% CL**	**Upper 95% CL**	**Mean Bias**	**Mean Relative Bias**
BAS (x 10^3/µL)	**Sysmex**	0.484	0.007	-0.008	0.023	0.866	0.333	1.398	0.04	11.87%
BAS (%)	**Blood Smear**	0.725	0.334	0.260	0.408	0.466	0.209	0.724	-0.01	43.99%

Flagging

The WBC flagging rate for HemoScreen was compared to the WBC differential results displayed by the predicate and blood smears for the same samples. Two types of abnormalities were evaluated: (1) distributional abnormal samples, which are samples where the quantity of at least one of the differential parameters resides outside of the normal concentrations, and (2) morphological abnormal samples, which are samples that contain atypical forms of the normal cell types contained in ordinary blood samples. A total of 402 whole blood specimens were analyzed across three clinical sites. The ability to identify abnormal samples and listed pathologies was evaluated according to CLSI H20-A2 by creating predictive value tables for distributional and morphological classifications, separately and combined. From these tables, the positive percent agreement (PPA), negative percent agreement (NPA), and overall agreement were calculated along with their respective exact binomial 95% two-sided confidence intervals across the three sites. All these analyses were performed for each abnormality type (distributional and morphological) separately and for the overall sensitivity to abnormal WBC.

Diagnostic Accuracy – Overall WBC Flagging, HemoScreen versus Predicate

	%	Lower 95% CL	Upper 95% CL
PPA	95.9%	93.0%	97.9%
NPA	82.1%	73.4%	88.8%
Overall Agreement	92.3%	89.2%	94.7%

Diagnostic Accuracy – Overall WBC Flagging, HemoScreen versus Blood Smear

	%	Lower 95% CL	Upper 95% CL
PPA	93.8%	90.3%	96.3%
NPA	71.7%	62.4%	79.8%
Overall Agreement	87.6%	83.9%	90.6%

Reference Intervals- Adult Males and Females (CLSI EP28-A3C)

The reference intervals study was conducted at a single US site. The target was to evaluate a minimum of 120 male subjects and 120 female subjects. One tube of freshly collected K_2EDTA venous blood was collected from healthy (self-reported) adult (19-69 years old) male and female volunteers on a single occasion. Each blood sample was analyzed by HemoScreen by routine

procedure in one replicate, and all 20 parameters were reported. The reference intervals were calculated in accordance with CLSI standard EP28-A3C; namely, 95% distribution-free reference intervals (male and female) were identified per parameter, which were based on the 2.5th and 97.5th percentiles of each variable. The results are presented below.

HemoScreen Reference Intervals for All Parameters

Parameter	Female (n=123)		Male (n=120)	
	Lower Limit	Upper Limit	Lower Limit	Upper Limit
WBC (x 10^3/µL)	4.0	11.5	3.6	10.2
RBC (x 10^6/µL)	3.6	5.1	4.2	6.0
HGB (g/dL)	10.8	15.6	12.5	17.6
HCT (%)	32.9	45.6	39.0	52.0
MCV (fL)	78.1	99.2	74.9	98.0
MCH (pg)	24.4	32.8	23.8	32.8
MCHC (g/dL)	30.7	34.7	30.9	35.6
RDW (%)	11.7	16.1	11.8	14.9
PLT (x 10^3/µL)	179	450	141	437
MPV (fL)	9.6	14.0	9.3	15.9
NEUT (x 10^3/µL)	1.8	8.4	1.7	7.4
LYMP (x 10^3/µL)	1.3	3.9	1.2	3.8
MONO (x 10^3/µL)	0.1	0.6	0.1	0.8
EOS (x 10^3/µL)	0.0	0.4	0.0	0.5
BASO (x 10^3/µL)	0.00	0.03	0.00	0.02
NEUT (%)	41.0	79.6	34.7	73.4
LYMP (%)	16.7	51.7	20.7	56.9
MONO (%)	1.7	7.5	1.7	9.4
EOS (%)	0.3	5.9	0.3	7.7
BASO (%)	0.0	0.3	0.0	0.4

Vein to Capillary Equivalency

The objective of the study was to demonstrate equivalency between capillary K_2EDTA whole blood samples and venous K_2EDTA whole blood samples using the HemoScreen device. A total of 75 normal and pathological paired capillary and venous whole blood specimens were drawn from volunteer subjects across three clinical sites. Each of the venous and capillary specimens was assayed once on the HemoScreen by the intended users, twice on the predicate by laboratory personnel, and samples were also measured by an automated blood smear method (2 slides/200 cells counted per slide for a total of 400 cells) by experienced operators who also verified its results.

The capillary whole blood results obtained from the HemoScreen were compared to the corresponding results from:

1. The venous whole blood results of the same donor obtained from the HemoScreen.
2. The capillary whole blood results of the same donor obtained from the comparative method.

For all 20 parameters, against all comparators, for all values with and without flagged results, the 95% confidence intervals for mean bias / mean relative bias were within the acceptance limits.

For MON%, the point estimate of the correlation between HemoScreen capillary and blood smear capillary met the acceptance limit when flagged results were excluded. For the rest ofparameters, against all comparators, and for all results with and without flags, the correlation point estimates met the acceptance criteria.

The results demonstrated comparable performance characteristics for capillary and venous whole blood specimens, and therefore support the claim of using the two specimen types for measurement on the HemoScreen.

807.92 (b)(3): Conclusions from Nonclinical and Clinical Data
The conclusions drawn from the analytical and clinical data demonstrate that the device is safe and effective for its intended use.