DEPARTMENT OF HEALTH & HUMAN SERVICES

Public Health Service

Food and Drug Administration
10903 New Hampshire Avenue
Document Control Center – WO66-G609
Silver Spring, MD 20993-0002

August 1, 2017

CellaVision AB
c/o Constance G. Bundy
C G Bundy LLC
435 Rice Creek Terrace NE
Fridley, MN 55432

Re: K171315
Trade/Device Name: CellaVision DM96 and DM1200 with Advanced RBC Application
Regulation Number: 21 CFR 864.5260
Regulation Name: Automated cell-locating device
Regulatory Class: Class II
Product Code: JOY
Dated: April 30, 2017
Received: May 4, 2017

Dear Ms. Bundy:

We have reviewed your Section 510(k) premarket notification of intent to market the device referenced above and have determined the device is substantially equivalent (for the indications for use stated in the enclosure) to legally marketed predicate devices marketed in interstate commerce prior to May 28, 1976, the enactment date of the Medical Device Amendments, or to devices that have been reclassified in accordance with the provisions of the Federal Food, Drug, and Cosmetic Act (Act) that do not require approval of a premarket approval application (PMA). You may, therefore, market the device, subject to the general controls provisions of the Act. The general controls provisions of the Act include requirements for annual registration, listing of devices, good manufacturing practice, labeling, and prohibitions against misbranding and adulteration. 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 Parts 801 and 809); medical device reporting (reporting of medical device-related adverse events) (21 CFR 803); good manufacturing practice requirements as set forth in the quality systems (QS) regulation (21 CFR Part 820); and if applicable, the electronic product radiation control provisions (Sections 531-542 of the Act); 21 CFR 1000-1050.

If you desire specific advice for your device on our labeling regulation (21 CFR Part 801), please contact the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm. Also, please note the regulation entitled, "Misbranding by reference to premarket notification" (21CFR 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 the CDRH's Office of Surveillance and Biometrics/Division of Postmarket Surveillance.

You may obtain other general information on your responsibilities under the Act from the Division of Industry and Consumer Education at its toll-free number (800) 638-2041 or (301) 796-7100 or at its Internet address http://www.fda.gov/MedicalDevices/ResourcesforYou/Industry/default.htm.

Sincerely,

Leonthena R. Carrington -S

Lea Carrington, MS, MBA, MT(ASCP)
Director
Division of Immunology and Hematology Devices
Office of *In Vitro* Diagnostics and
Radiological Health
Center for Devices and Radiological Health

Enclosure

4 Indications for Use Statement

DEPARTMENT OF HEALTH AND HUMAN SERVICES
Food and Drug Administration

Indications for Use

Form Approved: OMB No. 0910-0120
Expiration Date: January 31, 2017
See PRA Statement below.

510(k) Number *(if known)*

Device Name
CellaVision DM96 and DM1200 with Advanced RBC Application

Indications for Use *(Describe)*

The CellaVision DM1200 with the Advanced RBC Application is an automated cell-locating device, intended for in-vitro diagnostic use.

The CellaVision DM1200 with the Advanced RBC Application automatically locates and presents images of blood cells on peripheral blood smears. The operator identifies and verifies the suggested classification of each cell according to type.

The CellaVision DM1200 with the Advanced RBC Application is intended for blood samples that have been flagged as abnormal by an automated cell counter.

The CellaVision DM1200 with the Advanced RBC Application is intended to be used by skilled operators, trained in the use of the device and in recognition of blood cells.

The CellaVision DM96 with the Advanced RBC Application is an automated cell-locating device, intended for in-vitro diagnostic use.

The CellaVision DM96 with the Advanced RBC Application automatically locates and presents images of blood cells on peripheral blood smears. The operator identifies and verifies the suggested classification of each cell according to type.

The CellaVision DM96 with the Advanced RBC Application is intended for blood samples that have been flagged as abnormal by an automated cell counter.

The CellaVision DM96 with the Advanced RBC Application is intended to be used by skilled operators, trained in the use of the device and in recognition of blood cells.

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.

This section applies only to requirements of the Paperwork Reduction Act of 1995.

DO NOT SEND YOUR COMPLETED FORM TO THE PRA STAFF EMAIL ADDRESS BELOW.

The burden time for this collection of information is estimated to average 79 hours per response, including the time to review instructions, search existing data sources, gather and maintain the data needed and complete and review the collection of information. Send comments regarding this burden estimate or any other aspect of this information collection, including suggestions for reducing this burden, to:

Department of Health and Human Services
Food and Drug Administration
Office of Chief Information Officer
Paperwork Reduction Act (PRA) Staff
PRAStaff@fda.hhs.gov

"An agency may not conduct or sponsor, and a person is not required to respond to, a collection of information unless it displays a currently valid OMB number."

FORM FDA 3881 (8/14) Page of PSC Publishing Services (301) 443-6740 EF

510(k) Summary

This 510(k) summary is being submitted in accordance with the requirements of 21 CFR807.92.

510(k) Number
K171315

I. SUBMITTER

CellaVision AB
Ideon Science Park
SE-223 70 Lund
Sweden
Phone: +46 46 286 44 00
Fax: +46 46 286 44 70

Contact Person: Constance G. Bundy
CG Bundy LLC
435 Rice Creek Terrace NE
Fridley, MN 55432
USA
Phone: 763-574-1976

Date Prepared: April 30, 2017

II. DEVICE

Name of Device:	Advanced RBC Application
Common or Usual Name:	Automated cell-locating device
Classification Name:	Automated cell-locating device (21 CFR 864.5260)
Regulatory Class:	II
Product Code:	JOY

III. PREDICATE DEVICES

a) Romanowsky stain manual light microscope process for cell classification (21CFR 864.3600 Class I exempted from pre-market notification procedure).
b) RBC functionality of the Peripheral Blood Application of the CellaVision DM Software installed on the legally marketed DM Systems, DM96 (K033840) and DM1200 (K092868).

IV DEVICE DESCRIPTION

The Advanced RBC Application is substantially equivalent to the RBC functionality included in the predicate DM Systems. It pre-characterizes the morphology of the red

blood cells in a sample based on abnormal color, size, and shape (Poikilocytosis). In addition to that, the Advanced RBC Application also pre-characterizes based on different types of Poikilocytosis and on the presence of certain inclusions.

The DM Systems display the result of the RBC pre-characterization as the percentage of abnormal cells for each morphological characteristic and as an automatically calculated grade (0 – normal through 3 – marked), corresponding to that percentage. It also displays an overview image of the RBC monolayer. The difference between the current RBC functionality and Advanced RBC Application is the analysis technique, which enables the Advanced RBC Application to pre-characterize RBC into 21 morphological characteristics as opposed to the current RBC functionality with 6 morphological characteristics. The cell images are pre-characterized into different groups of morphological characteristics based on size, color, shape and inclusion using segmentation, feature calculation and the deterministic artificial neural networks (ANNs) trained to distinguish between morphology characteristics of red blood cells.

Another difference is that the red blood cells, pre-characterized by the Advanced RBC Application, can be displayed both in an overview and in individual images on the screen, while the current RBC functionality displays the pre-characterized red blood cells in an overview image only.

As in the current RBC functionality, the user reviews the overview image and can change the characterization by manually changing the grades for any morphological characteristic. With the Advanced RBC Application, the user can also view individual cells, grouped by morphological characteristic and change the characterization by re-classifying individual cells.

V. INTENDED USE

The CellaVision DM1200 with the Advanced RBC Application is an automated cell-locating device, intended for in-vitro diagnostic use.

The CellaVision DM1200 with the Advanced RBC Application automatically locates and presents images of blood cells on peripheral blood smears. The operator identifies and verifies the suggested classification of each cell according to type.

The CellaVision DM1200 with the Advanced RBC Application is intended for blood samples that have been flagged as abnormal by an automated cell counter.

The CellaVision DM1200 with the Advanced RBC Application is intended to be used by skilled operators, trained in the use of the device and in recognition of blood cells.

The CellaVision DM96 with the Advanced RBC Application is an automated cell-locating device, intended for in-vitro diagnostic use.

The CellaVision DM96 with the Advanced RBC Application automatically locates and presents images of blood cells on peripheral blood smears. The operator identifies and verifies the suggested classification of each cell according to type.

The CellaVision DM96 with the Advanced RBC Application is intended for blood samples that have been flagged as abnormal by an automated cell counter.

The CellaVision DM96 with the Advanced RBC Application is intended to be used by skilled operators, trained in the use of the device and in recognition of blood cells.

VI. COMPARISON OF THE ADVANCED RBC APPLICATION WITH THE PREDICATE DEVICES

Table 0:1 Comparison table

Characteristic	Manual light microscopic process	DM Systems	DM Systems with Advanced RBC Application
Intended use	Manual method for cell-locating and identification of red blood cells from peripheral blood smears. Verification of results by skilled human operator.	DM Systems is an automated cell-locating device, intended for in-vitro diagnostic use. DM Systems automatically locates and presents images of blood cells on peripheral blood smears. The operator identifies and verifies the suggested classification of each cell according to type. DM Systems is intended to be used by skilled operators, trained in the use of the device and in recognition of blood cells.	DM Systems with the Advanced RBC Application is an automated cell-locating device, intended for in-vitro diagnostic use. DM Systems with the Advanced RBC Application automatically locates and presents images of blood cells on peripheral blood smears. The operator identifies and verifies the suggested classification of each cell according to type. DM Systems with the Advanced RBC Application is intended for blood samples that have been flagged as abnormal by an automated cell counter. DM Systems with the Advanced RBC Application is intended to be used by skilled operators, trained in the use of the device and in recognition of blood cells.
Intended use population	The intended use population is patients whose blood samples have been flagged as abnormal by an automated cell counter.	The intended use population is patients whose blood samples have been flagged as abnormal by an automated cell counter.	The intended use population is patients whose blood samples have been flagged as abnormal by an automated cell counter.
Specimen type	Peripheral blood.	Peripheral blood.	Peripheral blood.
Sample preparation	Romanowsky stained blood film on glass slides of peripheral whole blood.	Romanowsky stained blood film on glass slides of peripheral whole blood.	Romanowsky stained blood film on glass slides of peripheral whole blood.

Characteristic	Manual light microscopic process	DM Systems	DM Systems with Advanced RBC Application
Analysis technique	The examiners characterize red blood cell morphology from an overview based on size, color, shape and inclusion.	The device presents an overview image. The cell images are pre-characterized into 6 different morphological characteristics based on size color and shape using segmentation, feature calculation and classification (decision tree):	The device presents an overview image. The cell images are pre-characterized into 21 different morphological characteristics based on size, color, shape and inclusion using segmentation, feature calculation and the deterministic artificial neural networks (ANNs) trained to distinguish between morphology characteristics of red blood cells.
Pre-characteriztion	N/A	The cell images are pre-characterized into the following morphologies: - *Polychromatic cells;* - *Hypochromatic cells;* - *Anisocytosis;* - *Microcytes;* - *Macrocytes; and* - *Poikilocytosis.*	The cell images are pre-characterized into the following morphologies: - *Polychromatic cells;* - *Hypochromatic cells;* - *Anisocytosis;* - *Microcytes;* - *Macrocytes;* - *Poikilocytosis;* - *Target cells;* - *Schistocytes;* - *Helmet cells;* - *Sickle cells;* - *Spherocytes;* - *Elliptocytes;* - *Ovalocytes;* - *Tear drop cells;* - *Stomatocytes;* - *Acanthocytes;* - *Echinocytes;* - *Howell-Jolly bodies;* - *Pappenheimer bodies;* - *Basophilic stippling;* and - *Parasites.*
User-defined characteristics	N/A	The operator can further characterize into 10 user-defined characteristics.	The operator can further characterize into 10 user-defined characteristics.
Verification of results	N/A	The operator verifies the suggested morphological characteristics by accepting or re-characterizing.	The operator verifies the suggested morphological characteristics by accepting or re-characterizing.
510(k) numbers	510(k) exempt (864.3600)	K033840 (DM96) K092868 (DM1200)	N/A

VII. PERFORMANCE DATA

The following performance data were provided in support of the substantial equivalence determination.

Software Verification and Validation Testing
Software verification and validation testing were conducted and documentation was provided as recommended by FDA's Guidance for Industry and Staff, "Guidance for the Content of premarket Submissions for Software Contained in Medical Devices." The software application was considered as a "moderate" level of concern, since a malfunction failure or latent design flaw in the software could lead to an erroneous diagnosis or a delay in delivery of appropriate medical care that could lead to a minor injury.

Reproducibility and repeatability
The reproducibility study was performed at three sites with samples collected from routine workflow from hospital laboratories including normal and elevated levels for each of the 21 RBC morphological characteristics. The reproducibility study was based on the CLSI EP05-A3 guidance document. From each sample, 3 slides were prepared. The slides were then run at each site 2 times a day for 5 days. The grading reproducibility was calculated by determining the relation between the occurrence of true grade and the total number of runs. The proportional cell count in percent for each morphological characteristic was used to estimate total variance and variance components for within-run (i.e. repeatability), between-run, and between-day and between-site based on CLSI EP05-A3. The results met the predefined acceptance criteria.

The repeatability study was performed according to the CLSI EP05-A3 guidance document. Samples were run 2 times a day with 2 replicates per run for 20 days on both DM96 and DM1200. The study was designed to provide repeatability data for both qualitative results (i.e. grade 0, 1, 2 and 3) and quantitative results (i.e. proportional count) for each morphological characteristic. The grading agreement was calculated for each slide and for each sample by determining the relation between the occurrence of true grade and the total number of runs for each morphological characteristic. The proportional cell count in percent for each morphological characteristic was used to estimate total variance and variance components for repeatability (i.e. within-run), between-run, and between-day based on CLSI EP05-A3. The results met the predefined acceptance criteria.

Clinical Evaluation
A comparison study was conducted comparing the Advanced RBC Application installed on CellaVision DM96 and CellaVision DM1200 (Test Methods) with the manual microscopy (Reference Method). For characterization of the RBC group Size (i.e Macrocytes, Microcytes and Anisocytosis), the manual microscopy as a standard reference is highly difficult, time consuming and thereby impractical. Therefore, an automated cell counter, as a more convenient predicate device (non-reference standard) was used.
The study was performed based on the approved guidance document CLSI H20-A2. Samples were collected and tested for RBC characterization on DM96 and DM1200 at different laboratories. The samples included blood samples, collected in accordance

with the target patient population, i.e. from samples flagged as abnormal by an automated cell counter.

The objective of the evaluation was to show that the RBC characterization results using the CellaVision Advanced RBC Application are equivalent with results achieved using the comparative method.

The comparison study demonstrates that for the morphology group Size the overall agreement as well as positive percent agreement (PPA) and negative percent agreement (NPA), fulfilled the acceptance criteria for samples run on the DM Systems. For the groups Color, Shape, Inclusions and the clinical significant morphologies the efficiency, sensitivity and specificity, fulfilled the acceptance criteria. Further, the study demonstrates that the sensitivity and specificity for the individual morphological characteristics fulfilled the target limits.

Based on the clinical performance as documented in the clinical study, the Advanced RBC Application was found to have a safety and effectiveness profile that is similar to the predicate device.

VIII CONCLUSION

Based on extensive testing, including comparison to the predicate devices, it is the conclusion of CellaVision AB that the DM Systems with the Advanced RBC Application are substantially equivalent to devices already on the market and do not raise any new questions regarding safety and effectiveness.