May 19, 2023

Beta Bionics, Inc.
Vikram Verma
Senior Director Regulatory Affairs
300 Baker Ave Ste 301
Concord, MA 01742-2131

Re: K220916
Trade/Device Name: iLet® Dosing Decision Software
Regulation Number: 21 CFR 862.1356
Regulation Name: Interoperable Automated Glycemic Controller
Regulatory Class: Class II
Product Code: QJI
Dated: December 20, 2022
Received: December 20, 2022

Dear Vikram Verma:

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/combination-products/guidance-regulatory-information/postmarketing-safety-reporting-combination-products); 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 https://www.fda.gov/medical-devices/medical-device-safety/medical-device-reporting-mdr-how-report-medical-device-problems.

For comprehensive regulatory information about medical devices and radiation-emitting products, including information about labeling regulations, please see Device Advice (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance) and CDRH Learn (https://www.fda.gov/training-and-continuing-education/cdrh-learn). 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 (https://www.fda.gov/medical-devices/device-advice-comprehensive-regulatory-assistance/contact-us-division-industry-and-consumer-education-dice) for more information or contact DICE by email (DICE@fda.hhs.gov) or phone (1-800-638-2041 or 301-796-7100).

Sincerely,

Marianela Perez-torres -S

Marianela Perez-Torres, Ph.D.
Acting Director
Division of Chemistry
and Toxicology Devices
OHT7: Office of In Vitro Diagnostics
Office of Product Evaluation and Quality
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: 06/30/2023
See PRA Statement below.

510(k) Number *(if known)*
K220916

Device Name
iLet® Dosing Decision Software

Indications for Use *(Describe)*
The iLet Dosing Decision Software is intended for use with compatible integrated continuous glucose monitors (iCGM) and alternate controller enabled (ACE) pumps. A self-monitoring of blood glucose (SMBG) meter may also be used for manual input of blood glucose values to continue insulin dosing for a limited period of time when input from the iCGM is temporarily not available. The iLet Dosing Decision Software autonomously determines and commands an increase, decrease, maintenance, or suspension of all basal doses of insulin and autonomously determines and commands correction doses of insulin based on input from an iCGM, and it autonomously determines and commands meal doses of insulin based on meal announcements. iLet Dosing Decision Software is intended for the management of type 1 diabetes mellitus in people 6 years of age or older. iLet Dosing Decision Software is intended for single patient use and requires a prescription.

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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K220916 510(k) Summary

Manufacturer

510(k) Owner: Beta Bionics, Inc.
Address: 300 Baker Avenue, Ste. 301, Concord, MA 01742
Phone: (978) 602-6239

Contact Person

Name of Contact Person: Vikram Verma
E-mail: vverma@betabionics.com
Date of Summary Preparation: May 17, 2023

Device Names and Classification

Trade Name of Device: iLet® Dosing Decision Software

Common Name of Device: Interoperable Automated Glycemic Controller (iAGC)

Classification Name: Interoperable automated glycemic controller (21 CFR 862.1356, QJI)

Predicate Devices
Control-IQ Technology (Tandem Diabetes Care, Inc., K200467)

Description of Device and Principle of Operation
The iLet Dosing Decision Software is an iAGC indicated for the management of type 1 diabetes mellitus. It autonomously determines and commands an increase, decrease, maintenance, or suspension of all basal doses of insulin and autonomously determines and commands correction doses of insulin based on input from an iCGM, and it autonomously determines and commands meal doses of insulin based on meal announcements. The iLet Dosing Decision Software is intended for the management of type 1 diabetes in people 6 years of age or older.

The iLet Dosing Decision Software works in conjunction with a compatible alternate controller enabled (ACE) pump. The dosing decision software includes adaptive control algorithms that autonomously and continually adapt to the ever-changing insulin requirements of each individual to enable lifelong adaptive learning. The iLet Dosing Decision Software only requires initialization with the user's body mass (body weight).

The iLet Dosing Decision Software does not require carbohydrate counting by the user or the use of carbohydrate- to-insulin ratios. Although the iLet system does not require a user to enter an exact carb amount to calculate and administer a meal bolus, it does require that the user announce the meal (e.g., breakfast, lunch, dinner) AND provide an estimated carb content as "Usual", "More", or "Less" than is routine for that meal type.

The iLet Dosing Decision Software does not require any information about the user's total daily dose of insulin, basal or long-acting insulin requirements, or insulin correction factors. It is an

insulin titration system that requires no insulin-dose determinations by the user or provider. During normal operation, the iLet bionic pancreas (iLet ACE Pump with the iLet Dosing Decision Software installed) autonomously responds every five minutes to a glucose signal, from an iCGM that is worn by the user, by computing a control signal that translates to a dose of insulin, which is intended to be delivered to the user through the subcutaneous (SC) route. The iLet dosing decision software has three insulin controllers (algorithms) running in parallel: an adaptive basal insulin controller, which continually adapts to each individual's basal metabolic need for insulin, an adaptive bolus controller which provides doses that are required above and beyond the basal metabolic needs, and an adaptive meal dose controller which provides insulin in response to a meal announcement.

The iLet is intended to dose insulin based on CGM data. In the events where CGM stops providing glucose data to the iLet, the iLet Dosing Decision Software BG-run mode feature will serve to temporarily continue insulin delivery. BG-run mode will determine and command basal insulin based on past requirements and will allow announcement of meals and entry of fingerstick BG measurements, which will be treated as iCGM data and may result in commanding administration of insulin or temporary suspension of basal insulin. BG-run mode use should always be for the shortest duration possible with the goal to resume CGM.

Indications for Use

The iLet Dosing Decision Software is intended for use with compatible integrated continuous glucose monitors (iCGM) and alternate controller enabled (ACE) pumps. A self-monitoring of blood glucose (SMBG) meter may also be used for manual input of blood glucose values to continue insulin dosing for a limited period of time when input from the iCGM is temporarily not available. The iLet Dosing Decision Software autonomously determines and commands an increase, decrease, maintenance, or suspension of all basal doses of insulin and autonomously determines and commands correction doses of insulin based on input from an iCGM, and it autonomously determines and commands meal doses of insulin based on meal announcements. iLet Dosing Decision Software is intended for the management of type 1 diabetes mellitus in people 6 years of age or older. iLet Dosing Decision Software is intended for single patient use and requires a prescription.

Intended Use, Technological and Performance Characteristics of Subject Device Compared with Predicate Device

Table 1: iLet Dosing Decision Software Comparison With Predicate Device

	Control IQ (Predicate Device) (K200467)	**iLet Dosing Decision Software (Subject Device)**	**Comment**
Intended Use	An iAGC which is intended to work with an iCGM and ACE pump to increase, decrease, or suspend delivery of insulin for management of type 1 diabetes	An iAGC which is intended to work with an iCGM and ACE pump to increase, decrease, or suspend delivery of insulin for management of type 1 diabetes	Identical
Communication	Communicates with an ACE pump	Communicates with an ACE pump	Identical

	Control IQ (Predicate Device) (K200467)	iLet Dosing Decision Software (Subject Device)	Comment
Required user input settings	Personal Profiles: up to 6 sets that combine basal rate, insulin-to-carb ratio, insulin correction factor, target glucose value for particular times of the day, active insulin time	User's weight Although the iLet system does not require a user to enter an exact carb amount to calculate and administer a meal bolus, it does require that the user announce the meal (e.g., breakfast, lunch, dinner) AND provide an estimated carb content as "Usual", "More", or "Less" than is routine for that meal type. No meal announcement is advised if a meal contains a very small amount of carbohydrates (approximately less than a quarter of usual).	The iLet Dosing Decision Software iAGC determines all doses autonomously every 5 minutes without any required programmed rates, factors, ratios, profiles, settings, or duration of insulin action, except the user's weight. No basal rates, insulin delivery profiles, basal rate segments, basal rate increments or temp basal rate settings are required to be set or used and entering these settings is not needed. No bolus setup, insulin-to-carb ratio, correction factor, quick bolus increments or extended bolus time settings are required to be set or used and entering these settings is not needed. Target glucose setting is available. Meal announcements do not involve carb counting; instead, the user can select one of three qualitative meal sizes for each type of meal (breakfast, lunch, or dinner) as having Usual for me, More, or Less carbs.
Maximum Basal Rate	15 units/hr.	0 – 11.5 units/hr	Basal rate in subject device is internal and cannot be set. Effective Rates are provided corresponding to isolated basal doses.
BG Target Value	When Control-IQ is set to ON, Target BG is fixed to 110 mg/dL. When Control- IQ is set to OFF, there are 16-time segments with individually settable Target	CGM targets of 110 mg/dL, 120 mg/dL and 130 mg/dL	Similar; design feature and operation are supported by clinical study.

	Control IQ (Predicate Device) (K200467)	iLet Dosing Decision Software (Subject Device)	Comment
	BGs 70 to 250 mg/dL in 1 mg/dL increments		
Maximum Bolus Size	25 units	24 units for meal announcement, 30 units overall.	Similar
Maximum Automatic Bolus Size	6 units	3 units in response to CGM glucose, 6 units in response to isolated BG when CGM is offline	Similar

Hazard Analysis, Risk Mitigation

A hazard analysis was conducted to account for the unique design elements, intended use, and risks of the iLet bionic pancreas which includes the iLet Dosing Decision Software. The hazard analysis accounted for the risks associated with interoperability between the device and other third-party digital devices which met predefined criteria but were not specifically identified, including scenarios in which the device was put into an environment in which both compatible and incompatible digital devices attempted to communicate with the device and deliver commands. This analysis identified hazards which could reasonably be anticipated to impact the proper use of the device, traced all identified risks to adequate design controls, and demonstrated that design features were appropriately implemented and validated.

In addition, a Use Related Risk Analysis (URRA) was conducted that identifies all User Groups, User Tasks, Possible Use Errors, Potential Clinical Harm to Patient, Severity of Harm, Risk Mitigations and Validation Methods associated with use of the iLet device. Critical tasks per the FDA's guidance document Applying Human Factors and Usability Engineering to Medical Devices 2016 are identified within the URRA. The URRA includes all warnings, cautions, and contraindications.

Summary of Non-Clinical Performance Data and Conclusions including compliance with Special Controls

Analytical Performance

Analytical Performance testing is not applicable to the iLet Dosing Decision Software.

Other Supportive Test Data

- Biocompatibility, Sterility, Insulin Compatibility and Stability, Electrical EMC and Safety, CGM connectivity, Packaging/ Shipping Integrity and Mechanical Tests:

  These tests are not applicable to the iLet Dosing Decision Software as it is a software device.

- Data logging and Interoperability:

  The iLet ACE Pump and iLet Dosing Decision Software have been validated for logging timestamped events, including information related to its state, user inputs, and device settings, as required by special controls. All tests passed.

The iLet ACE Pump and iLet Dosing Decision software have been validated to be interoperable with all connected devices.

- Cybersecurity:
  The iLet Dosing Decision Software has incorporated adequate mitigations for cybersecurity risks. A cybersecurity analysis was performed using the draft FDA guidance, Content of Premarket Submissions for Management of Cybersecurity in Medical Devices – Issued October 18, 2020, and the principles outlined in the FDA guidance, Postmarket Management of Cybersecurity in Medical Devices – Issued December 28, 2016. Beta Bionics has provided a software bill of materials and penetration testing.

- Labeling and Training:
  The iLet bionic pancreas device labeling and training, including the iLet Dosing Decision Software. for users and healthcare practitioners was reviewed by the FDA. Labeling is sufficient and satisfies applicable requirements of 21 CFR 801 and 21 CFR 809.

Special Controls
The iLet Dosing Decision Software was found to be compliant with all Special Controls for Interoperable Automatic Glycemic Controller (21 CFR 862.1356, QJI).

Summary of Human Factors and Clinical Performance Data and Conclusions
Human Factors
Beta Bionics executed a human factors and usability engineering process that followed and complied with FDA-recognized standards IEC62366:2015-1 and HE75:2009 as well as the FDA's guidance document, Applying Human Factors and Usability Engineering to Medical Devices – Issued February 3, 2016. Human Factors validation study testing was conducted with the iLet bionic pancreas (iLet ACE Pump with the iLet Dosing Decision Software installed) in a simulated use condition, including associated training and accompanying documentation. The results of the validation study demonstrated the iLet system has been found to be safe and effective for the intended users for its intended uses in its intended use environment.

Clinical Performance
A pivotal clinical study was conducted to evaluate the use of the iLet Dosing Decision Software. A summary of the clinical performance data and conclusions is provided below:

Study Design: A prospective, multi-center, randomized controlled trial (RCT) was conducted with 440 adult and child participants with Type 1 diabetes at 16 clinical sites in the United States. The primary objective of the study was to assess the efficacy and safety of the iLet Dosing Decision Software (embedded in the insulin-only configuration of the iLet ACE Pump) relative to standard care in adults and children with type 1 diabetes (T1D).

Participants were randomized to use of the iLet Bionic Pancreas System or standard of care (SC) and followed for 13-weeks. An optional 48-60 hour ancillary study followed the RCT in which

blood glucose meter input was used for the iLet rather than continuous glucose monitor input to evaluate the BG-run feature.

Methods: The study had three parts: the 13-week RCT, the 2-4 day Transition Phase for the iLet Bionic Pancreas Group, and the optional Blood Glucose (BG) Test Run Ancillary Study for the iLet Bionic Pancreas Group.

Informed consent was obtained and eligibility was assessed. As part of screening/baseline testing, psychosocial questionnaires were completed, and baseline Dexcom G6 Continuous Glucose Monitor (CGM) data were obtained unless the participant was using a personal Dexcom G6 with at least 85% of possible glucose data in last 14 days in which case the participant could skip the CGM data collection (personal CGM data used for baseline).

Adult participants 18 years old were randomly assigned in a 2:2:1 ratio to:

- iLet Bionic Pancreas (BP) Group with Novolog or Humalog (iLet-N/H)
- iLet Bionic Pancreas Group with Fiasp (iLet-F)
- Standard Care (SC) Group

Pediatric participants (6–<18 years old) were randomly assigned in a 2:1 ratio to:

- BP Group with Novolog or Humalog (iLet-N/H)
- SC Group

Participants assigned to the BP Groups were trained on use of the iLet Bionic Pancreas System. Participants in the SC Group continued their usual method for insulin delivery (pump or injections) and were instructed on continuous use of an unblinded Dexcom G6 CGM.

Phone contacts occurred after 1-2 days and 7 (±2) days after randomization and visits occurred at 2 weeks (±4 days), 6 weeks (±4 days), 10 weeks (±4 days), and 13 weeks (91–98 days from randomization). Visits could be conducted virtually. At the 6-week and 13-week visits, a blood sample was obtained for central lab HbA1c determination and psychosocial questionnaires were completed. Data from the iLet, including CGM data, was uploaded to the cloud for analysis.

BG Test Run: Participants in the BP Groups had the option of participating in an ancillary study for 48-60 hours, commencing at the 13-week visit during which a blinded CGM was worn instead of the unblinded CGM and BG values from fingersticks were used as input into the iLet.

Endpoints: The primary analysis included both the pediatric and adult participants in a single analysis comparing the iLet-N/H Group with the SC Group. HbA1c at 13 weeks was the primary endpoint. Time <54 mg/dL measured with CGM over the 13 weeks was considered a key secondary endpoint.

Other key secondary endpoints included:

- Mean glucose
- Time 70-180 mg/dL
- Time >180 mg/dL
- Time >250 mg/dL

- Standard deviation
- Additional CGM metrics

Separately, the iLet-F Group was compared with the adult iLet-N/H Group and the adult SC Group.

Safety outcomes included Severe hypoglycemia, diabetic ketoacidosis, and other serious adverse events.

Conclusions: Use of the bionic pancreas with Novolog/ Humalog or Fiasp was safe when compared with standard of care. Two diabetic ketoacidosis events occurred in the iLet Group related to infusion set failures. The ancillary BG run, along with the analysis of data collected through the 13-week RCT period, demonstrated that the bionic pancreas can be safely used with the blood glucose meter input temporarily instead of CGM should this become necessary for a user.

The preceding summary of predicate device comparison, non-clinical bench testing which supports the subject device design, human factors study testing, and the pivotal study clinical validation results demonstrate that the subject device performance is substantially equivalent to the predicate device.