The iPRECIO® is for use in Laboratory Animal Research ONLY. Not for human use.

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The World’s First, Smallest, High precision, Wirelessly controlled, Programmable Implantable Micro Infusion Pump for Mice.
This implantable infusion pump uses a patented, microprocessor controlled peristalsis mechanism for accurate controlled flow. It is the only implantable and programmable pump for mice. iPRECIO® can infuse fluids continuously at accurate low flow rate via software programming and it can be refilled via a percutaneously accessible port.
iPRECIO® SMP-310R Key Features

- Accurate patented Rotary Finger Method
  - Every pump is factory tested and calibrated
  - Better than +/-5% accuracy
  - 0 µl/hour to 10.0 µl/hour in 0.1µl/hour steps
  - Programmable infusions protocols (simple and complex)
- Totally implanted in subcutaneous space
- Refillable (reservoir) percutaneously via refill port with re-sealable septum
- With iPRECIO® catheters, test your drug’s effects nearly anywhere
- Easy to use state of the art software for infusion protocol programming using profiles

Implantable

The pump can be completely implanted in small laboratory animals subcutaneously. Thus, the animal moves freely without any restraint (i.e. tethering) during drug infusion. Additionally, infection risk is reduced, and the animal is likely to be significantly less stressed than in a tethered infusion model.

Refillable

You can replenish any medical fluid in the pump via percutaneous access to the pump refill septum and reservoir after implantation of the pump. Therefore, long-term drug infusion can continue until the installed battery life has run out. The reservoir is elastic and configured in such a geometry as to allow gentle palpation to confirm an approximate level of fluid in the reservoir.

Precision

The technology driving the infusion is a patented “Rotary Finger” method. This method is a unique form of peristalsis. The precise “micro-stick” pushes a rubber tube in the pump in a uniform and sequential manner. The accuracy of iPRECIO is +/-5%.

Wireless

Wireless programming allows all pumps to be conveniently detected, assigned, programmed and monitored via our IMS-310R iPRECIO Management system. Once completely programmed wirelessly, the iPRECIO SMP-310R Pumps will independently infuse as programmed until completed or aborted without any further communications with the IMS-310R.

In ideal conditions* with a small number pumps, SMP-310R Micro Infusion Pump allows in-vivo re-programming for maximum flexibility. If no effect is detected, pump may be re-programmed to infuse at a higher flow rate. A higher concentration drug/TA may also be used. Communications Availability (Comms Avail) of SMP-310R may be programmed to maximize battery life or maximum responsiveness. Options are provided in Infusion Profile (Group ID) settings.

Programmable

Using the easy to use state of the art iPRECIO® software, header information along with infusion profile details are entered and ultimately downloaded to the pump’s memory. Start Time, End Time, Flow-rate (0.0µl/hour to 10.0µl/hour), and infusion profiles may be programmed. These profiles include sustained release, modified release, chronically release and pulsatile release. A total of 15 steps with repeat function allows both complex and simple infusion profiles to be programmed.

*ideal conditions: every minute communication availability, low external wireless interferences, pumps close to programming station, etc. Contact Primetech Corporation (iprecio@primetech.co.jp) to discuss in more detail in-vivo requirements.

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Programmable

15 steps for flow rate or dose programming: 0.0 - 10.0 ul/hr

Each flow profile may contain up to 15 doses or flow rate steps. A single step would mean a fixed continuous dose or flow-rate for the study duration. A more complex infusion profile will contain more than 1 step and may contain up to 15 steps.

In addition to the 15 steps, Repeat Mode may be used. Repeat Mode allows more complex infusions like circadian rhythm, modified release, chrono release and pulsative release to be programmed for daily/weekly/etc repeats.

Keep Vein Open (KVO), Dead Volume Calculation and Flushing

KVO checkbox and Dead volume setting.

A recovery period may be programmed into the flow profile using the KVO checkbox and Dead Volume Setting Options. KVO function where saline or vehicle is infused to ensure patency of the catheter. During this time, the animal recovers from the implant surgery.

When using KVO, a function of the software allows to calculate the total dead volume of the catheter and pump to ensure that the test article (TA) or drug hits the animal at the programmed start time. Flushing of the dead volume may be programmed by the user and the software automatically calculates when to exchange saline/vehicle to TA/drug.
**Monitoring Function**

Monitoring Function allows the user to follow the infusion profile in detail. Refill dates/exchange dates and alarms are also managed and displayed here.

**Battery Life**

The battery life is up to 68 days at a flow rate of 0.1µL/hr continuously. Battery life is calculated and estimated in iPRECIO® Software and this is dependent on pump switch on date, infusion profile including KVO and communication availability selected. These specifications are subject to change for product improvements. Exact durations and calculations will be managed by the iPRECIO® Software. When used in preprogrammed (None/no communication) mode, battery life is maximized. When communications availability is set to 1 minute, maximum responsiveness is selected and this gives the lowest battery life.

Communications availability does not mean that there will always be data or connection every minute. Actual data will be dependent on wireless environment and infusion protocol.

<table>
<thead>
<tr>
<th>Flow rate (µL/hr)</th>
<th>Drive time (hours)</th>
<th>Driving days (days)</th>
<th>Per minute</th>
<th>Every 2 hours</th>
<th>Every 6 hours</th>
<th>Every 24 hours*</th>
<th>None*</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.1</td>
<td>159</td>
<td>6.6</td>
<td>534.5</td>
<td>22.3</td>
<td>1075</td>
<td>44.8</td>
<td>560.6</td>
</tr>
<tr>
<td>0.5</td>
<td>157.1</td>
<td>6.5</td>
<td>482.2</td>
<td>20.1</td>
<td>898.2</td>
<td>37.4</td>
<td>1228.5</td>
</tr>
<tr>
<td>1.0</td>
<td>154.8</td>
<td>6.5</td>
<td>433.7</td>
<td>18.1</td>
<td>751.1</td>
<td>31.3</td>
<td>970.3</td>
</tr>
<tr>
<td>5.0</td>
<td>139.3</td>
<td>5.8</td>
<td>266.3</td>
<td>11.1</td>
<td>249.1</td>
<td>10.4</td>
<td>361.9</td>
</tr>
<tr>
<td>10.0</td>
<td>122.5</td>
<td>5.1</td>
<td>180.3</td>
<td>7.5</td>
<td>199.2</td>
<td>8.3</td>
<td>202.9</td>
</tr>
</tbody>
</table>

* Depending on wireless environment, infusion protocol programmed, communication availability/logging interval, pump logs may be overwritten before being collected.

**Table above outlines the maximum battery life for the programmed protocol and pump switch on time. Exact battery life will be dependent on pump switch on time, programmed infusion protocol, and selected communication availability. iPRECIO Management Software helps the user calculate battery life for selected programming.

**Not all communication availability options shown in table. Full options: Every minute, None, every hour, 2 hours, 4 hours, 6 hours, 12 hours and 24 hours in Application Software.**

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**Programmable**

**Programming Workflow**

**STEP 1**

Start of Study Design:
Study name, ID, user and date are input and saved.

**STEP 2**

Pumps and Animal Setting:
Here, total number of animals for study are entered and associated with an animal ID. Information including weight, sex, species, strain, administration site may be entered and saved.

**STEP 3**

Infusion Profile (Group ID) Programming including Keep Vein Open (KVO) Setting
When requiring a recovery period following surgery, KVO setting may be used to maintain catheter patency and also program a dead volume flush as a next step. Following these steps, Drug Administration Protocol may be programmed – continuous, intermittent, circadian & bolus. Everything required is programmed into the Infusion Profile (Group ID).

**STEP 4**

Infusion Protocol Setting
This is to program the TA or drug administration start time. If programmed, it also includes the parameters for flushing the dead volume and pump start time based on calculated dead volume, flushing flow-rate and exchange stop time.

Communications Available (Comms Avail) is also programmed in Infusion Profile (Group ID).
Specifications

Micro Infusion Pump iPRECIO®

- Infusion Method: Rotary Finger Method (piston type)
- Reservoir: 150µL Built-in Elastic Reservoir (Medical Grade SBS)
- Tubing: Inner Tubing: (Material) Medical Grade SEBS
- Outer Tubing: (Material) Medical Grade SEBS (φ1/2inch) (φ2/3inch) Length: approx. 140mm
- Re/fill Port: 2mm re/fill port is on the top of the pump.
- Data Communication: Wireless (Frequency: 922.1 MHz / North America / FCC) (Frequency: 865.5 MHz / Europe / CE)
- Tubing: 2mm re/fill port is on the top of the pump.

Reservoir

- Range of Flow Rate (FR): ±5% (under 0 - 80cmH2O pressure)
- Reservoir volume: 20/uni03BCL to 100/uni03BCL

Antenna

- Embedded FPC pattern antenna inside a pump

Power On & Activation Method

- Pump activation is programmed in Infusion Profile (Group ID)
- Pump is switched ON magnetically.

Battery Life

- FR 0.1ul/hr: 6.6 days and 10ul/hr: 5 days for Comm Avail of 1 minute.
- Continuous driving life: FR 0.1ul/hr: 68 days, FR 10ul/hr: 8.5 days

Radio Communication

- Communication Distance: 1-6 meter radius of transmitter
- (This is based on open field condition)

Communication with Pump

- iPRECIO® Management System
- Automated Recognition of Pump
- Pump’s ID and Calibration Factor are recognized by data communication device

iPRECIO® Management System

- Study Management: Study Information, Animal Information, Group Information
- User Account: Register, manage user account name and password, Administrator Information
- Automated Recognition of Pump
- Pump’s ID and Calibration Factor are recognized by wireless data communication.

Pump Programming via Software

- Programmable Parameters
- Start day / time, Flow rate or Dose Setting, Duration of infusion
- Programming Infusion Steps
- Maximum of 15 steps (including KVO) of flow rate (or dose) as needed.
- Auto Calculation of Battery
- Programming of multiple steps and repeating such groups are available.
- Dead Volume Setting
- Available KVO Setting
- You can load preset default values or set desired flow rate and flow rate for each study.

PC OS compatible

- Windows 7 Professional or higher, Windows 8 Professional, Education, Japanese and English Language with major PC manufacturer

Data Communication Device

- Interface: Ethernet (crosed cable)
- Communication with Pump: Wireless (Frequency: 922.1 MHz / North America / FCC) (Frequency: 865.5 MHz / Europe / CE)
- Power Supply: USB adapted included:
  - (Weight) 35g (Length of cable) 1.1m
- Size / Weight: 145 (L) x 95 (W) x 55 (H) mm / TBD

Study Management

- Study Information
- Animal Information
- Group Information
- Log
- infusion schedule
- Monitoring, Management of infusion schedule
- Manage infusion volume and schedule, Checking and record refil and replacement of infusate timing, Setting threshold of remaining volume in the reservoir, Showing start time inside the window

Innovative drug infusion technology for laboratory animals.