Micro infusion pump

iPRECIO®
Implantable, Programmable and Refillable

www.iprecio.com

SMP/IMS-310R Model
The World's First, Smallest, High precision, Wirelessly controlled, Programmable Implantable Micro Infusion Pump for Mice

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

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Authorized Distributor in North America
alzet@durect.com, 1-800-692-2990.
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 0.1 µl/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.

### 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 (0.0 µl/hour to 10,000 µl/hour), and infusion profiles may be programmed.

These profiles include sustained release, modified release, chronotropic release and pulsatile release. A total of 15 steps with repeat function allows both complex and simple infusion profiles to be programmed.

### 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.

*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.

### Precision

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

Pumps and Animal Setting:
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.

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).

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).

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 67 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>Communication availability/Logging interval</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>Flow rate (µL/hr)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.1</td>
<td>157</td>
<td>6.5</td>
<td>528</td>
<td>22.0</td>
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<tr>
<td>0.5</td>
<td>155</td>
<td>6.6</td>
<td>476</td>
<td>19.8</td>
<td>887</td>
</tr>
<tr>
<td>1.0</td>
<td>153</td>
<td>6.4</td>
<td>428</td>
<td>17.8</td>
<td>742</td>
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<tr>
<td>5.0</td>
<td>153</td>
<td>5.7</td>
<td>263</td>
<td>11.0</td>
<td>344</td>
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<tr>
<td>8.0</td>
<td>127</td>
<td>5.3</td>
<td>207</td>
<td>8.6</td>
<td>243</td>
</tr>
<tr>
<td>10.0</td>
<td>121</td>
<td>5.9</td>
<td>178</td>
<td>7.4</td>
<td>196</td>
</tr>
</tbody>
</table>

* Depending on wireless environment, infusion protocol programmed, communication availability/logging interval, pump may be overheated 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.
Specifications

- **Micro Infusion Pump iPRECIO®**
  
  - **Reservoir**
    - Inner Tubing: Medical Grade SEBS
    - Outer Tubing: Medical Grade SEBS
  
  - **Tubing**
    - Inner Diameter: 0.55mm
    - Length: approx. 140mm
  
  - **RF/ill Port**
    - 2mm RF/ill port is on the top of the pump.
  
  - **Data Communication**
    - Wireless (FCC): 923.1 MHz (North America / FCC) / 865.5 MHz (Europe / CE)
    - Communication Distance: 1-6 meter radius of transmitter
  
  - **Battery Life**
    - FR 0.1ul/hr: 6.5 days and 0.0ul/hr: 5 days for Comm Avail of 1 minute.
  
  - **Pump Programming via Software**
    - Programmable Parameters: Start day / time, Flow rate or Dose Setting, Duration of infusion
    - Programming Infusion Steps: Minimum of 3 steps including KVO of flow rate or dose as needed. Grouping of multiple steps and repeating such groups are available.
    - Auto Calculation of Battery usage and infusion duration
    - Dead Volume Setting: Using value calculated by catheter size (diameter) and length or input measured actual volume.

- **Research Applications**
  
  - Cardiovascular
  - Neuroscience
  - Cancer
  - Drug Discovery

- **Study Management**
  
  - Study Information, Animat Information, Group Information
  
  - User Account
    - Register, manage user account names and passwords, Administrator Information
  
  - Automated Recognition of Pump
    - Pump’s ID and Calibration Factor are recognized by wireless data communication.

- **Management Software**
  
  - User Manual
  - Study Information
  - Animal Information
  - Group Information
  - Log
  - Infusion schedule
  - Monitoring, Management of infusion schedule
  - Log
  - After infusion, you can export study data and infusion log in CSV format. Infusion log is transferred to the software in order by wireless data communication during infusion.

- **iPRECIO® Management System**
  
  - Interface
    - Ethernet (crossed cable): Operates via internal internet by setting fixed IP address with the data communication device.
  
  - Communication with Pump
    - Wireless (FCC): 923.1 MHz (North America / FCC) / 865.5 MHz (Europe / CE)
  
  - Power Supply
    - USB adaptor included
    - (Weight): 35g (Length of cable): 1.1m

- **Study Information**
  
  - Study Information, Animal Information, Group Information
  - User Account
  - Administrator Information
  - Study Information
  - Animal Information
  - Group Information
  - Log
  - Infusion schedule
  - Monitoring, Management of infusion schedule
  - Log
  - After infusion, you can export study data and infusion log in CSV format. Infusion log is transferred to the software in order by wireless data communication during infusion.

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

- **Innovative drug infusion technology for laboratory animals.**

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