Micro infusion pump

Implantable, Programmable and Refillable

The World's First, Smallest, High precision, Wirelessly controlled, Programmable Implantable Micro Infusion Pump for Mice

SMP/IMS-300 Model

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The iPRECIO® is for use in Laboratory Animal Research ONLY. Not for human use.
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-300 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
  - 101 discreet infusion flow-rates
  - 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 restrain (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

SMP-300 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-300 may be programmed to maximize battery life or maximum responsiveness. Options are provided in both KVO setting and Group Profile (Infusion Protocol) setting.

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 flash memory. Start Time, End Time, Flow-rate (0.0µl/hour to 10.0µl/hour), and infusion profiles maybe programmed. These profiles include sustained release, modified release, chrono release and pulsatile release. A total of 15 steps with repeat function allows both complex and simple infusion profiles to be programmed.
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. (unless re-reprogrammed in-vivo)
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 maybe 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) Function

A recovery period maybe programmed using the 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 mode, 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 maybe 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 46 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, KVO duration, infusion profile 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/0 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>Communications Available</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>Drive time (hours)</td>
<td>Drive time (hours)</td>
<td>Drive time (days)</td>
<td>Drive time (days)</td>
<td>Drive time (days)</td>
<td>Drive time (days)</td>
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<td>737</td>
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<tr>
<td>5.0</td>
<td>255</td>
<td>10</td>
<td>360</td>
<td>15</td>
<td>374</td>
</tr>
</tbody>
</table>

* Depending on wireless environment, infusion protocol programmed, communication availability/logging interval, pump logs maybe 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.
Specifications

Micro Infusion Pump iPRECIO®

Reservoir
- 130µL Built-in Elastic Reservoir (Medical Grade SBS)

Tubing
- Inner Tubing: Material Medical Grade SBS
- Outer Tubing: Material Medical Grade SBS (SFL) Gas Inner Diameter: 0.55mm, Length: approx. 140mm

Refill Port
- 2mm refill port on the top of the pump.

Data Communication
- Wireless (Frequency: 916.15 MHz / North America / FCC) [864.35 MHz / Europe / CE]
- Communication Distance: 1 meter from UCD-300 reference point

Antenna
- A wire antenna attached to the pump (length: approx. 50mm, not removable)
- Material of Wire antenna: Titanium (0.1mm), Coated by 1.2 Fr Polyurethane Tubing

Range of Flow Rate (FR)
- ±5% (under 0 - 80cmH2O pressure)

Battery Life
- Activated by pressing down the power button placed on the bottom of the pump. On-off. Cannot be switched OFF.
- FR 0.1ul/hr: 46 days, 10ul/hr: 9 days

Sterilization
- EO Sterilized blister package (5pcs/box)
- EO Sterilized blister package (5pcs/box) SMP-300

Field of Applications

Cardiovascular
- Innovative drug infusion technology for laboratory animals.

Neuroscience
- in many different research and applications fields.

Cancer

Drug Discovery

Management Software

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
- Available KVO Setting
- Available VIVO Setting
- Available IVO Setting

Programming Infusion Steps
- You can configure in maximum 15 steps of flow rate (volume) as needed.

Auto Calculation of Battery
- When you input infusion protocol, it shows automatically remaining battery(time) and infusion duration (start and end of each steps) on the window.

Dead Volume Setting
- Using value calculated by catheter size (diameter) and length or input measured actual volume.

Flushing Setting
- You can load preset default values or set dead volume and flow rate for each study.

Monitoring, Management of infusion schedule
- Manage infusion volume and schedule, Checking and record refill and replacement of infusion tubing.

Log
- After infusion, you can export study data and infusion log in CSV format.

PC OS compatible
- Windows XP, Windows 7, 8, 8.1, 10 32 bit and 64 bit, Japanese and English Language with major PC manufacturer

Innovative drug infusion technology for laboratory animals.