products for
MICRODIALYSIS
research
Table of Contents

Introduction 1-3

Microdialysis for Basic Research

The Principle of Microdialysis 7

Microdialysis Academy 8

Microdialysis Systems and Configurations Overview 9-11

Probes

Overview 12-13
CMA 7 Microdialysis Probe 14
CMA 11 Microdialysis Probe 15
CMA 12 Microdialysis Probe 16
CMA 20 Microdialysis Probe 17
CMA 30 Linear Microdialysis Probe 18
CMA 31 Linear Microdialysis Probe 19
Probe Guide Cannulae 20
Custom Made Probes 21
Accessories - Probes 22-23

Instruments

CMA 120 System for Freely Moving Animals 24-25
Mouse Infusion Cage 26
Harvard/Instech Counter Balanced Lever Arms 27
Harvard/Instech Stainless Steel Swivels 28
Harvard/Instech Five Channel Swivels 29
Harvard/Instech Head Block Tethers 30
CMA 130 In Vitro Stand 31
CMA 400 Syringe Pump 32
CMA 402 Syringe Pump 33
CMA 402 Microdialysis CAD Software 34
Accessories - CMA 400 and 402 35
CMA 110 Liquid Switch 36
CMA 142 Microfraction Collector 37
CMA 470 Refrigerated Fraction Collector 38
CMA 450 Temperature Controller 39
Stereotaxic Equipment 40-41
Bone Micro Drill System 42
Cordless Clipper and Skin Tunneling Needles 43

Surgical Instruments

Minor Surgical Kit 44
Major Deluxe Surgical Kit 45
Rat Surgical Kit 46
Mouse Surgical Kit 47

General Information

Customer Support 50
Training Course 50
Contact Us 51
Our Vision

Exploring Tissue Chemistry!

The Company

CMA Microdialysis is a Swedish life science research tools company devoted to the development, manufacturing, and marketing of the microdialysis technique. The company was formed in 1984 as the first company in the world to market microdialysis products and know-how. Instruments and consumables are sold globally to universities and pharmaceutical companies as unique tools for in vivo sampling and monitoring of organs and tissues.

CMA is the market leader in the development and distribution of microdialysis products for scientific research.

With a highly specialized and skilled staff, consumables are manufactured in a clean room environment. The head office is located outside Stockholm, Sweden. CMA has distributors across the globe, responsible for local sales, service and support.

History

The concept of microdialysis was born in the early 1970's. While examining the cross-section of a blood vessel among fluorescent nerve endings, Professor Urban Ungerstedt of the Karolinska Institute in Stockholm had the idea of using a dialysis tube as “an artificial blood capillary”, in order to monitor chemical events in the tissue. The first paper on microdialysis was published in 1974. Since then, more than 13,000 scientific papers have been published on the technique, among them some 3,000 clinical investigations.

The CMA 10 Microdialysis Probe, the first commercially produced microdialysis probe in the world, was probably the most significant contribution toward the boom in the use of microdialysis in neurobiological research. The CMA 10 Probe has since been followed by several modifications directed toward improved spatial resolution and ease of use, as well as the addition of several new lines of probes to suit many different applications.

CMA's business concept is to develop microdialysis as a standard research tool in academic and industrial laboratories. CMA works in close cooperation with scientists all over the world with particular emphasis on scientific support, method development, offering of courses, literature, and more. The many applications of microdialysis are rapidly increasing with the spread of the technique throughout the world, placing CMA Microdialysis at the forefront both in terms of research and development and as a manufacturer/supplier of microdialysis technology and know-how.
Introduction

Products

CMA develops and produces a complete range of microdialysis products. The basic research portfolio includes a broad range of probes, pumps, fraction collectors and complete systems for research.

Research Applications

For more than thirty years, microdialysis has been used to study brain neurophysiology and the release of neurotransmitters, monoamines, and metabolites, amino acids and other small endogenous compounds.

With the introduction of several new microdialysis probes for use in the peripheral organs, microdialysis is seeing widespread use in sampling molecules in tissues such as muscle, liver and adipose tissue, as well as in the spinal cord, synovial fluid, vitreous humour, and blood, to assess the delivery and distribution of parent drug and metabolites and their effects on endogenous compounds.

As global drug development costs continue to escalate, partially because of the high attrition rate of development candidates, there is increasing pressure to improve the predictability of clinical outcomes from preclinical studies.

By understanding the exposure in the appropriate biophase, as well as the effect of a drug candidate at the site of action, selection and optimal doses of the best compound can be improved. Microdialysis is a practical and data-rich in vivo method, which is an extremely useful tool to investigate the PK/PD profiles of drug candidates.
CMA’s basic research solutions are used by leading pharmaceutical companies in the drug discovery process to assess drug concentrations at the site of drug action. Since the exchange of molecules through the dialysis membrane is in both directions, a microdialysis probe placed in target tissue can be used to continuously:

- Sample unbound drug and/or active metabolites as they arrive to the tissue following systemic administration.
- Deliver drug locally into an organ or tissue through the probe, and simultaneously collect endogenous target compounds to determine pharmacological effect.
- Assess controlled release of drugs from encapsulation \textit{in vivo}, within specific tissues.

In summary, Microdialysis is a valuable tool for \textit{in vivo} evaluation studies on drug delivery, drug metabolism, PK/PD, bioavailability, bioequivalence and pharmacological efficacy. It is the only technique that gives simultaneous \textit{in vivo} temporal information on unbound drug and metabolic levels as well as endogenous compounds in target tissues.

**Sales and Distribution**

CMA offers a complete and leading suite of microdialysis solutions to meet the needs of basic research. All products are produced under high quality standards and in a cleanroom environment in Sweden.

User meetings, seminars and courses are held regularly all over the world. Through a constant dialogue with our customers, the application areas of the microdialysis technique are expanding, and continuous development and improvement of our instruments is guaranteed.

Global support comes from the CMA Microdialysis home office located in Stockholm Sweden.
Microdialysis for Basic Research

Microdialysis Probes
Microdialysis Instruments
Surgical Instruments
Blood capillary

Extracellular fluid

Cell

Microdialysis probe
Microdialysis for Basic Research

The Principle of Microdialysis

Microdialysis is a technique used to monitor the chemistry of the extracellular space in living tissue. Microdialysis gives you a preview of what goes on in tissues, before chemical events can be reflected as changes in systemic blood levels. The microdialysis probe is designed to mimic a blood capillary and by keeping this metaphor in mind, it is easy to conceive of the many ways you can use this technique.

Following implantation into a tissue, a physiological salt solution is slowly pumped through the microdialysis probe. In the area of the membrane, this solution equilibrates with the surrounding tissue extracellular fluid such that when collected at the outlet, this microdialysate solution will contain a representative proportion of the tissue fluids molecules. It can then be analyzed for compounds that may have been present in this tissue compartment. A microdialysis probe is usually constructed as a concentric tube where the perfusion fluid enters through an inner tube, flows to its distal end, exits the tube, and enters the space between the inner tube and the outer dialysis membrane. The direction of flow is now reversed and the fluid moves toward the outlet tubing into a collection vial.

The “dialysis”, i.e. the diffusion of molecules between the extracellular fluid and the perfusion fluid, takes place while the perfusion fluid passes between the inner tube and the dialysis membrane. It is important to realize that there is an exchange of molecules in both directions. The difference in concentration through the membrane governs the direction of the gradient.

An endogenous compound can be collected at the same time that an exogenous compound is introduced, for example a drug, into the tissue. Recovery: The gradient of a particular compound depends not only on the difference in concentration between the perfusate and the extracellular fluid, but also on the velocity of flow inside the microdialysis probe.

The absolute recovery (mol/unit time) of a substance from the tissue depends on the cut-off of the dialysis membrane*, the length of the membrane, the flow of the perfusion fluid, and the diffusion coefficient of the compound through the extracellular fluid.

* Usually defined as the molecular weight in Daltons at which 80% of the molecules are prevented from passing through the membrane.
Microdialysis Academy
Design your own microdialysis experiment

The following is a simple checklist to help you design your own microdialysis experiment:

1. PROPERTIES OF THE PROBE MEMBRANE
   A membrane with a low molecular weight cut off purifies your sample by excluding large molecules, while a high molecular cut off recovers some larger substances, such as peptides or proteins.

2. LENGTH OF THE MEMBRANE
   A longer membrane yields a better recovery of the substances of interest, however, the choice may be limited by the size of the structure you want to study.

3. PERFUSION FLOW
   Use a high flow if you want to remove or introduce as many molecules as possible per unit time or a low flow if you want to obtain a more concentrated dialysate. It is worth considering that a high flow is liable to disturb the physiology simply because more substances are removed.

4. COMPOSITION OF THE PERFUSION FLUID
   Ideally, it should be as close as possible to the composition of the extracellular fluid. However, you may want to change the concentration of sodium, potassium, or calcium in order to influence the cell membrane function in the region you are studying.

5. TYPE OF PROBE
   A stiff probe is suitable for a stereotaxic experiment on the brain while a flexible probe may be better suited for dialysis in a peripheral organ such as adipose tissue, muscle, liver, or kidney. A brain probe may require a pre-implanted guide cannula while a subcutaneous probe may be implanted an hour or so before the start of the experiment.

6. TIME NEEDED TO OBTAIN STEADY STATE CONDITIONS
   The introduction of a probe into the tissue will always cause damage and the recovery of function will take a certain period of time. An hour or two is often used to reach “baseline conditions”.

7. DOES THE ANIMAL HAVE TO BE AWAKE OR CAN IT BE KEPT UNDER ANAESTHESIA?
   Using awake animals does not necessarily mean that the conditions are more “normal”. An awake animal is subject to pain and stress that may influence the results as much as the anaesthesia.

8. DESIGN OF A CONTROL EXPERIMENT
   This is certainly one of the most important parts of any experimental design. One may have difficulty in determining the influence of a great number of known or unknown variables in your experiment, however, a well designed control experiment will take care of many of these problems.

9. DOSE RESPONSE EXPERIMENTS
   Microdialysis is a wonderful technique for studying drug actions. The ease by which one can follow the time course of local drug concentrations in tissue and drug effects on local physiology is one of the really strong points of the technique. However, it is surprising how few publications include a dose response study, especially as we know that the qualitative action of a drug often changes as the dose changes.

10. SAMPLE VOLUME REQUIRED FOR ANALYSIS
    Is a small sample volume and a high concentration (e.g. HPLC) or a large sample volume and a high amount of the particular compound (e.g. RIA - Radio Immuno Assay) required? You may want to choose a low or a high perfusion flow, respectively.

11. TEMPORAL RESOLUTION NEEDED IN YOUR EXPERIMENT
    Frequent sampling usually means higher perfusion flow in order to get enough sample volume for the analysis.

12. INSTRUMENT SET UP
    For example, do you need to change the perfusion fluid during the experiment in order to introduce a drug or change the ionic composition of the fluid? In that case you may need a liquid switch or a pump with syringes that can be individually controlled.
There are a few different models of each component in the microdialysis system and each is described in this catalog. Your choice of components, or system configuration, should be based on the application and the experimental requirements. After deciding to work with anesthetized or freely moving animals, take a look at a few of the more common configurations below, from the basic system with a two-syringe pump and 20-sample fraction collector, to the four-syringe pump with 64-sample refrigerated fraction collector. If you don’t see the system that is right for you, design your own. Your CMA Representative will be glad to help you. Just don’t forget the small surgical supplies and accessories such as the syringes, perfusion fluid, tubing and adapters, trephine drills, anchor screws, probes, and guide cannulae, as well as probe clips, vials, and caps which complete the system.

A microdialysis system may include the following:
- Syringe pump
- Syringes, perfusion fluid
- Liquid switch
- In Vitro storage stand
- Microdialysis probes and guide cannula
- Fraction collector
- Temperature controller
- Tubing and tubing adapters
- Surgical supplies and accessories

Microdialysis Systems for Anesthetized Animals

CMA 400 Syringe Pump
CMA 110 Liquid Switch
CMA 470 Refrigerated Fraction Collector
Probe
CMA 450 Temperature Controller
CMA 130 In Vitro Stand
Stereotaxic Instrument
Microdialysis Systems and Configurations

Overview

CMA 402 Syringe Pump
CMA 110 Liquid Switch
CMA 470 Refrigerated Fraction Collector
Probe
CMA 450 Temperature Controller
Stereotaxic Instrument

Microdialysis Systems for Freely Moving Animals

CMA 400 Syringe Pump
CMA 110 Liquid Switch
CMA 470 Refrigerated Fraction Collector
Probe
CMA 120 System for Freely Moving Animals (incl. Bowl, Swivel Assembly and Balance Arm)
Instrument Table
Microdialysis Systems and Configurations

Overview

CMA 400 Syringe Pump
CMA 110 Liquid Switch
CMA 142 Microfraction Collector
Probe
CMA 120 System for Freely Moving Animals (incl. Bowl, Swivel Assembly and Balance Arm)
Instrument Table

CMA 402 Syringe Pump
Micro T
CMA 142 Microfraction Collector
Probe
CMA 120 System for Freely Moving Animals (incl. Bowl, Swivel Assembly and Balance Arm)
Instrument Table
Microdialysis Probes

Overview

CMA 7 Probe + Guide Cannula
- Ideal for CNS studies in small animals
- Designed for dialysis in transgenic mice, available β-irradiated
- Low internal volume
- Available membrane: Cuprophane, 6 kDa MWCO
- Membrane lengths - 1 and 2 mm
- Membrane diameter - 0.24 mm
- Coordinating guide cannula

CMA 11 Probe + Guide Cannula
- For use in discrete brain regions
- High spatial resolution, available β-irradiated
- Causes minimal tissue damage
- Available membrane: Cuprophane, 6 kDa MWCO
- Membrane lengths - 1, 2, 3 or 4 mm
- Membrane diameter - 0.24 mm
- Coordinating guide cannula

CMA 12 Probe + Guide Cannula
- Optimized for CNS use
- Ideal for chronic implantation
- Range of different lengths
- Available membranes: PAES, 20 kDa MWCO
  PES, 100 kDa MWCO
- Membrane lengths - 1, 2, 3 or 4 mm
- Membrane diameter - 0.5 mm
- Coordinating guide cannula

ALL CMA MICRODIALYSIS PROBES have the same concentric construction except the linear probes. An inner cannula leads the perfusion fluid from the inlet to the tip of the probe where it comes in contact with the semi-permeable membrane. The fluid then continues up through the outer shaft on its way to the outlet. All metal parts are treated to prevent oxidation of labile compounds in the perfusate. A variety of probe types, sizes, and membranes are described over the next few pages. Probes are delivered in vacuum-sealed packages, 3 pcs/pkg, or 4 pcs/pkg, and each probe is guaranteed for a single use. Flexible probes are packaged with introducers and split tubing guides. The linear probes consist of a tubing in which the middle part has a window with a membrane, where microdialysis takes place. Complete instructions are included in each package.
Microdialysis for Basic Research

Microdialysis Probes

Overview

- Tailored for dialysis in peripheral tissues and blood vessels
- Inlet and outlet tubing is attached
- Soft, non-metallic construction
- Available membranes:
  - PAES, 20 kDa MWCO
  - PES, 100 kDa MWCO
- Membrane lengths - 4 or 10 mm

CMA 20 Probe + Introducer

- Ideal for peripheral tissues as well as for spinal cord and tumors
- Soft and flexible construction
- Can be sterilized with ethylene oxide
- Available membrane:
  - Cuprophane, 6 kDa MWCO
- Membrane lengths - 10 mm

CMA 30 Linear Probe

CMA 31 Linear Probe

- Ideal for peripheral tissues as well as for spinal cord and tumors
- Soft and flexible construction
- Can be sterilized with ethylene oxide
- Available membrane:
  - PAES, 55 kDa MWCO
- Membrane lengths - 10 mm

Custom Made Probes

- For all occasions when standard probes are not appropriate
- Variety of styles and sizes according to the physio-chemical characteristics of recovered molecules, various organs, and biological species
- Customer specified style, shaft length, membrane type, membrane length and cut-off
- Coordinating guide cannula
THE CMA 7 MICRODIALYSIS PROBE is ideal for use in small areas of the brain or spinal cord of small animals. It is especially suitable for studies in transgenic mice. A β-irradiated version of this product is available for use in experiments where it is essential to minimize contamination by pathogens.

The construction and geometry of the probe tip is exactly the same as in the CMA 11. The outer diameter of the CMA 7 Microdialysis Probe is 0.24 mm and the shaft length is 7 mm. The steel shaft is treated to prevent oxidation of labile compounds in the perfusate.

An extremely small plastic body where the inlet and outlet tubing are directly mounted makes the probe easy to implant and light for a small animal to carry. A coordinating small and lightweight guide cannula is available (see probe guides, page 20).

CMA 7 Microdialysis Probes are guaranteed for single use. Complete instructions are included in each package.
CMA 11 Microdialysis Probe
for discrete areas in the CNS

THE CMA 11 MICRODIALYSIS PROBE is ideal for use in small areas of the brain or spinal cord, possesses greater spatial resolution, and causes less tissue damage due to its reduced size. The probe has a cuprophane membrane with an outside diameter of 0.24 mm. The outer steel shaft diameter is 0.38 mm. The inner cannula is constructed of fused silica coated with polyimide. The inlet/outlet capillaries are mounted in a yellow plastic body matched to the size of a corresponding guide cannula. Once implanted, the probe sits tightly in the guide cannula’s capsule without the need for screwing or cementing. FEP tubing is connected to the probe using tubing adapters (see accessories, page 22-23). β-irradiated CMA 11 probes are available for use in experiments where it is essential to minimize contamination by pathogens. Note: not for use in humans.

The CMA 11 Microdialysis Probes are guaranteed for single use. Complete instructions are included in each package.
CMA 12 Microdialysis Probe
for regular use in the CNS

ORDERING INFORMATION

CMA 12 Microdialysis Probe
3/pkg

Available membranes:
Polyarylethersulfone (PAES), 20 000 Daltons cut-off
Polyethersulfone (PES), 100 000 Daltons cut-off

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TECHNICAL INFORMATION

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* Optimized for CNS use  * Easily reusable  * Ideal for chronic implantation  * 20 000 and 100 000 Daltons cut-off

THE CMA 12 MICRODIALYSIS PROBE is ideal for stereotaxic work in the CNS of anesthetized or conscious animals. A semi-permeable membrane is glued between the tip of the inner steel cannula and the outer steel shaft. The perfusion fluid enters the membrane space through the inner cannula and flows into the shaft to the outlet. All metal parts are treated to prevent oxidation of labile compounds in the perfusate. The membrane is available in both 20 000 and 100 000 Daltons cut-off.

The inlet and outlet are mounted in a plastic body matched to the size of a corresponding CMA 12 guide cannula. Once implanted, the probe sits tightly in the guide cannula’s capsule without the need for screwing or cementing. FEP tubing can be connected to the probe using tubing adapters (see accessories, page 22-23).
CMA 20 Microdialysis Probe
A flexible probe for peripheral tissues

ORDERING INFORMATION

CMA 20 Microdialysis Probe
Includes:
3 Probes/pkg
3 Introducers/pkg
9 Split Tubing/pkg

Available membranes:
Elite: Polyarylethersulfone (PAES)
20,000 Daltons cut-off
High cut-off: Polyethersulfone (PES)
100,000 Daltons cut-off

Membrane length
CMA 20 Elite
4 mm  CMA 8010435
10 mm  CMA 8010436
CMA 20 High cut-off
4 mm  CMA 8309670
10 mm  CMA 8309671

TECHNICAL INFORMATION

* Soft, non-metallic construction * Easy implantation procedure
* Ideal for cell metabolism studies * 20 000 and 100 000 Daltons cut-off

THE CMA 20 MICRODIALYSIS PROBE is designed for dialysis experiments in moving soft tissues such as muscle, heart, skin and adipose tissue, as well as in blood, vitreous fluid of the eye, synovial fluid etc. As with the other models, the probe is constructed in a concentric design, but is made completely from plastic materials. Due to its flexibility, the probe must be implanted in the tissue with the help of a steel needle and split tubing, the Introducer. The membrane is available in both 20,000 and 100,000 Daltons cut-off.

The CMA 20 Microdialysis Probes are guaranteed for single use. Complete instructions are included in each package.
CMA 30 Linear Microdialysis Probe
Ideal for peripheral tissues

**ORDERING INFORMATION**

CMA 30 Linear Microdialysis Probe 4/pkg

Available membranes:
Cuprophane, 6,000 Daltons cut-off

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**TECHNICAL INFORMATION**

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<td>Double tubing length</td>
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- Ideal for peripheral tissues as well as for tumors
- Soft and flexible construction
- Easy implantation
- Can be sterilized with ethylene oxide

**THE CMA 30 LINEAR MICRODIALYSIS PROBE** is ideal for peripheral tissues such as skin, muscle, heart, adipose tissue, liver, eye, pancreas, as well as spinal cord and tumors.

The probe consists of tubing, in which the middle part has a window where the membrane is located. Along the membrane, a thin part of the tubing remains to increase the stability and also to support the membrane during withdrawal from the tissue. The inlet of the probe has a Luer Lock connector that can be attached to a single use syringe, or can be cut off in order to use a glass syringe with a fixed needle and a tubing adapter.

One package contains 4 probes, each in an individual pouch that includes an introducer. The probe can be sterilized in its package with ethylene oxide and each is guaranteed for single use.
THE CMA 31 LINEAR MICRODIALYSIS PROBE is ideal for peripheral tissues such as skin, muscle, heart, adipose tissue, liver, eye, pancreas as well as spinal cord and tumors. The unique patented probe is very thin and has a 10 mm membrane with a 55,000 Daltons cut-off. This membrane allows studies on a wide range of substances.

The probe is easy to implant, using an introducer needle that is included. The inlet of the probe has a Luer Lock connector, which can be attached to a single-use syringe, or removed in order to use a glass syringe with a fixed needle and a tubing adapter.

One package contains 4 probes, each in an individual pouch, and includes an introducer. The probe can be sterilized in its package with ethylene oxide and each is guaranteed for single use.
CMA 7, CMA 11, AND CMA 12 GUIDE CANNULA

In many situations the intracerebral probe has to be implanted in a conscious animal or when experiments are performed on chronically implanted animals. In these cases, the implantation is facilitated by using guide cannulae.

These guide cannulae are made of biocompatible polyurethane. The cannulae are coated with silicone on the inside in order to prevent sticking of a dummy or probe. The guide cannula can be mounted to the stereotaxic instrument using a standard probe clip. Other small items such as trephine drill bits and anchor screws (see accessories, page 22-23) are necessary for proper fixation of the guide cannula to the skull.

Always consult CMA Microdialysis headquarters before ordering custom-made guides.

* Customer specified shaft length.
A VARIETY OF DIFFERENT constructions and sizes of microdialysis probes are available for various organs and biological species. Similarly, the length, the molecular weight cut-off, and the type of membrane should be optimized according to the physio-chemical characteristics of recovered molecules. Besides the standard types and lengths of microdialysis probes, CMA Microdialysis also offers custom-made probes of specific materials and in various geometries.

Always consult CMA Microdialysis headquarters before ordering custom-made probes.

**ORDERING INFORMATION**

Custom Made Probes

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Specify: Probe type, shaft material and length and membrane material and length.

* Customer specified shaft length
* Different membrane materials
* Customer specified membrane length
* Non-metallic probes
CMA PROBE CLIPS
These clips are used in conjunction with a connecting rod and adapter in stereotaxic work to place the probe or guide in an exact position in the tissue. The clips are also used separately when preparing and testing the probe.

There are three types of clips (FIG. 1):
The CMA 11+12 Clip holds the flat body of the CMA 11 or CMA 12 Probes or the CMA 11 and CMA 12 Guide Cannulae. The CMA 7 Clip holds the body of a CMA 7 Probe or Guide Cannula and the CMA Probe Shaft Clip holds the shaft of a probe.

FIG. 1

FEP TUBING (FIG. 2)
This precise tubing with 0.12 mm inner diameter (internal volume of 1.2 µL/100 mm length) is, together with the Tubing Adapters, ideal for use in microdialysis experiments.

TUBING ADAPTERS (FIG. 3)
These simple but secure connectors, which swell in 70% alcohol and shrink back in air, ensure tight, zero internal volume connections between FEP Tubing and the probe, swivel, liquid switch and syringes.
GLASS Ionomer Cement (FIG. 10)
This resin-based glass ionomer cement is ideal for permanent head attachment of microdialysis probes and head block tethers in rats and mice. It has significant advantages over the more commonly used methylmethacrylate cements. It bonds to bone, eliminating the need for bone screws in most cases. It has a lower temperature increase during polymerization. And it hardens more quickly with no noxious fumes.

The starter kit includes an applicator, five capsules and an SOP for rodent head attachment. Sold for laboratory animal research applications only.
CMA 120 System for Freely Moving Animals

ORDERING INFORMATION

CMA 120 System for Freely Moving Animals

Ref. No.

Includes:
CMA 120 Plastic Bowl
CMA 120 Swivel Assembly
CMA 120 Balance arm
Plastic Collar 100 pcs
Tubing Adapters 10 pcs
FEP tubing 1 m
Vial, Plastic 300 µL, 25 pcs
Caps, Plastic, 25 pcs

CMA 120 Plastic Bowl with Food and Water Containers CMA 8309672

* Balance arm with dual channel swivel
* Secures tubing away from the animal and prevents twisting

THE CMA 120 SYSTEM FOR FREELY MOVING ANIMALS enables Microdialysis studies on conscious, small laboratory animals over long periods of time. The CMA 120 instrument can be used in combination with any one of the microdialysis systems (see pages 9-11). The microdialysis probe is attached to a CMA Syringe Pump, the CMA 110 Liquid Switch, and to any of the CMA 142 or CMA 470 collection devices via a dual channel swivel. The swivel is mounted on the balancing arm allowing free movement of the animal. The swivel brace holds a wire with a collar connector and two holders for 300 µL plastic vials. The wire attached to the animal collar turns the swivel and supports the tubing. Manual fraction collection is used when two microdialysis probes are implanted, or when microdialysis is combined with local injection via one channel of the swivel.

THE NEW CMA 120 BOWL WITH FOOD & WATER CONTAINERS is used in studies where a freely moving animal will be contained for longer periods of time. The additions of these containers allow the animal to feed and drink ad libitum. The food container and water bottle are arranged on the outside of the bowl so as not to disturb the movement of the tethered animal when inside the bowl. Both containers are easily removed for cleaning and refilling.
CMA 120 System for Freely Moving Animals

Accessories

ORDERING INFORMATION

CMA 120 System for Freely Moving Animals, accessories

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Ref. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMA 120 System without Bowl</td>
<td>CMA 8409029</td>
</tr>
<tr>
<td>CMA 120 Plastic Bowl</td>
<td>CMA 8309031</td>
</tr>
<tr>
<td>CMA 120 Swivel Assembly</td>
<td>CMA 8309048</td>
</tr>
<tr>
<td>CMA 120 Swivel Assembly without Swivel</td>
<td>CMA 2409090</td>
</tr>
<tr>
<td>CMA 120 Wire Set with Collar Connector</td>
<td>CMA 2409051</td>
</tr>
<tr>
<td>CMA 120 Balance arm</td>
<td>CMA 8309032</td>
</tr>
<tr>
<td>Gimbal for Swivel</td>
<td>CMA 8002714</td>
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<tr>
<td>Dual Channel Swivel</td>
<td>CMA 61-0004</td>
</tr>
<tr>
<td>Dual Channel Swivel for mouse</td>
<td>CMA 8001346</td>
</tr>
<tr>
<td>Clamp for In Vitro Holder</td>
<td>CMA 8409033</td>
</tr>
<tr>
<td>Plastic Collar 100/pkg</td>
<td>CMA 7431059</td>
</tr>
<tr>
<td>Tubing Adaptors 10/pkg</td>
<td>CMA 3409500</td>
</tr>
<tr>
<td>FEP tubing, 1 m</td>
<td>CMA 3409501</td>
</tr>
<tr>
<td>FEP tubing, 10 x 1m/pkg</td>
<td>CMA 8409501</td>
</tr>
</tbody>
</table>

CMA 120 Instrument Table

For use in organizing all the components of your microdialysis experiment for ease of operation

See accessories next page. CMA 8309096
Mouse Infusion Cage

Durable polycarbonate cage designed to house tethered mice during short-term infusion and microdialysis experiments. Since the cage is round, tethers will not tangle as they sometimes can in shoebox-type cages. Also, animals are less likely to dislodge sensitive probes since there are no sharp corners. Handles at the top make it easy to move the cage.

This cage can be supplied with any combination of feeders and water bottles. Pictured below is an animal infusion system featuring our CMA 402 Syringe Pump, Mouse Cage with Water Bottle, Counter-Balanced Lever Arm, and a Stainless Steel Swivel. The pump, swivel and lever arm are sold separately.

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Mouse Infusion Cage</th>
<th>Ref. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Polycarbonate</td>
<td>CMA 61-0046</td>
</tr>
<tr>
<td>(21.6 cm (8.5 in) high)</td>
<td>CMA 72-0014</td>
</tr>
<tr>
<td>with Pellet Feeder</td>
<td>CMA 72-0015</td>
</tr>
<tr>
<td>with Water Bottle</td>
<td>CMA 72-0016</td>
</tr>
<tr>
<td>with Pellet Feeder &amp; Water Bottle</td>
<td>CMA 72-0016</td>
</tr>
</tbody>
</table>

**Accessories for Mouse Infusion Cage**

| Cover | CMA 61-0048 |
| Bottom Screen | CMA 61-0047 |
| 3.5 in (8.9 cm) Counter-Balanced Lever Arm | CMA 61-0024 |

- No sharp corners
- Tethers less likely to tangle
- Probes less likely to dislodge
- Durable polycarbonate for long life
THE COUNTER BALANCED LEVER ARM is designed to minimize stress on microdialysis probes, moves with the animal to prevent slack in the tether. Most other lever arms use a mass as the counterbalance; ours uses an adjustable spring, making it lighter and more responsive.

The mounting plate can be adjusted for mounting to the side or top of many types of cages, including our CMA 61-0046 Animal Container. If you are using a shoebox-type cage, a counter balanced lever arm can prevent the tether from tangling. The CMA 61-0024 is a 3.5 inch arm that is used in studies with mice.
For years, the CMA 61-0004 swivel has been the industry standard for awake animal microdialysis. It features quartz lining on the center channel to minimize dead volumes and reactivity with neurotransmitters. It is suitable for microdialysis on rats.

The CMA 72-0000 uses a completely different seal design with two significant improvements: quartz lining on both the center and side channels, and extremely low frictional torque, making it the first dual channel swivel that can be used with mice. However, this model is more fragile than the CMA 61-0004 and often cannot be repaired if clogged or damaged. It is suitable for microdialysis on rats or mice.

* Low torque quartz-lined dual channel swivel truly suited for microdialysis in mice
* Setting the industry standard for more than 30 years
These remarkable swivels feature low-dead-volume channels and rotational torque as low as that of our single channel models.

There are two standard configurations: CMA 72-6134 features four low dead volume channels for microdialysis, plus one 22 gauge channel for sampling or infusion, while the CMA 72-9351 has two low dead volume channels for microdialysis, plus three 22 gauge channels for sampling or infusion. The fluid paths are lined to protect sensitive neurotransmitters. The swivel includes a counter-balanced arm to remove all vertical forces from the animal, but it is not recommended for use with mice. The electronic control unit mounts to the vertical portion of the counter-balanced arm and is powered by a 12 VDC adapter.

The practical limit on the number of lines in a traditional fluid swivel has been two; swivels with three or more channels are typically impossible for a rodent to turn and often have large dead volumes or problems with cross-channel leakage. Harvard/Instech's Five Channel Swivel senses the rotation demanded by the animal and with a small motor, drives the swivel core to follow the animal. Unlike switch-based systems, this swivel features a proportional control, allowing fine continuous movement to minimize stress on the animal. The torque felt by the animal is similar to that of a single channel swivel.

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>Five Channel Swivels</th>
<th>Ref. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Powered Five Channel Swivel</td>
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<tr>
<td>5 Channels, 4 Microdialysis and 1 x 22 Gauge Channel, pkg. of 1</td>
<td>CMA 72-6134</td>
</tr>
<tr>
<td>5 Channels, 2 Microdialysis and 3 x 22 Gauge Channels, pkg. of 1</td>
<td>CMA 72-9351</td>
</tr>
</tbody>
</table>

**TECHNICAL INFORMATION**

| Number of Channels | 5 |
| Dead Volume: | |
| Microdialysis Channel | 6-7 µl |
| 22 Gauge Channel | 15-20 µl |
| Channel ID: | |
| Microdialysis Channel | 0.009 in (0.2 mm) |
| 22 Gauge Channel | 0.015 in (0.4 mm) |
| Channel OD | 0.028 in (22 g) |
| Materials in Fluid Path | Titanium, Polyimide, Teflon® |
| Rotational Activity Output | Analog Signal, +/-2V maximum |
| Lever Arm Length | 5.75in (14.6cm) |
| Swivel Dimensions (L x Dia) | 7in x 0.6in (18 x 1.5cm) |
| Swivel Weight | 95g (counterbalanced) |
Harvard/Instech Head Block Tethers

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Magnetic Head Block Tethers</th>
<th>Ref. No.</th>
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<tbody>
<tr>
<td>Magnetic Head Block Spring Tether, 1 base</td>
<td>CMA 72-4476</td>
</tr>
<tr>
<td>Looped Wire Tether,</td>
<td>CMA 72-4477</td>
</tr>
<tr>
<td>1 base, slotted clamp</td>
<td></td>
</tr>
<tr>
<td>Accessories</td>
<td></td>
</tr>
<tr>
<td>Replacement Magnetic Head Block Bases, sterile, pkg. of 10</td>
<td>CMA 72-4478</td>
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<tr>
<td>Replacement Looped Wire Magnetic Tethers, non-sterile, pkg. of 5</td>
<td>CMA 72-4479</td>
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<table>
<thead>
<tr>
<th>Head Block Tethers</th>
<th>Ref. No.</th>
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<tbody>
<tr>
<td>Head Block Tether for Rats</td>
<td>CMA 61-0036</td>
</tr>
<tr>
<td>Head Block Tether for Mice</td>
<td>CMA 61-0037</td>
</tr>
</tbody>
</table>

TECHNICAL INFORMATION

Experiment Duration: 1 to 60+ Days

<table>
<thead>
<tr>
<th>Clear Lumen Tether</th>
<th>Specifications:</th>
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</thead>
<tbody>
<tr>
<td>0.115 in Stainless steel</td>
<td>0.070 in Looped wire</td>
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<tr>
<td>12 in</td>
<td>12 in</td>
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</table>

<table>
<thead>
<tr>
<th>System Weight</th>
<th>Parts Included:</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 g</td>
<td>12 g</td>
</tr>
<tr>
<td>0.3 g</td>
<td>0.3 g</td>
</tr>
<tr>
<td>5 head block screws</td>
<td>5 head block pegs</td>
</tr>
<tr>
<td>Miniture nut Tether with blade</td>
<td>Peg sleeve</td>
</tr>
<tr>
<td>Tether with blade</td>
<td>Looped wire tether</td>
</tr>
</tbody>
</table>

Ref. No. CMA 61-0036 CMA 61-0037

- Makes microdialysis in awake mice possible
- Ideal for microdialysis in rats
- Little risk of animal infection
- Most frequently used microdialysis tether

Our head block tether assemblies were designed for microdialysis, but also work well for standard infusion applications. In fact, we have found that the head block tether is the best option for all applications when working with mice. It provides a solid attachment to the animal with little risk of infection.

HEAD BLOCK TETHER FOR RATS have a large lumen tether can accommodate two standard microdialysis probes allowing it to be set up in a number of configurations. A 3/4 inch slotted screw attaches to the animal's skull with Dental Acrylic as do the CMA 59-7351 Skull Mounting Screws and Probe Guides, see our website. A blade on the end of the stainless steel spring tether slides into the head mount screw and is secured with a knurled tubular nut.

HEAD BLOCK TETHER FOR MICE uses a fine 0.010 inch diameter looped wire making it extremely light weight and allowing it to easily transmit torque to the swivel as the mouse moves. A small peg attaches to the animal's skull with dental acrylic (see page 23). The wire tether is easily attached by inserting it into a hole in the peg and sliding a sleeve over it.

MAGNETIC HEAD BLOCK TETHER FOR RATS AND MICE uses magnets to connect the tether to a base that is attached to the skull using dental cement. Simply bring the two parts near each other and they will snap together. Tubing exits through a hole in the side of the side of the connector. Designed for rats or mice, tethers are available either with a protective spring or a lightweight looped wire. The CMA 72-4477 tether includes a special slotted clamp for direct attachment to the outlet tube of our swivels, see page 28 for more information. The bases are provided sterile; other components are non-sterile.
**THE CMA 130 IN VITRO STAND** is used for storage and during testing of microdialysis probes. The stand includes three holders for 1.5 mL Eppendorf tubes and three probe clips. There are three types of clips: The CMA 11+12 Clip holds the flat body of the CMA 11 or CMA 12 Probes or their Guide Cannulae. The CMA Probe Shaft Clip holds the shaft of the CMA 11 or CMA 12 Probe as well as the CMA 20 Probe, and the CMA 7 Clip holds the body of a CMA 7 Probe or Guide Cannula. The CMA 130 can be supplied with three combinations of clips. The clip can be mounted in the stereotaxic instrument using the stereotaxic adapter and the connecting rod.

**Different probe types mounted in clips:**
- **CMA 7 Clip**
- **CMA 11+12 Clip**
- **CMA Probe Shaft Clip**

**Lengthens probe life**  **Simplifies calibrations, recovery tests**

**Facilitates safe storage of probes**  **Connecting Rod for Clip**

**Stereotaxic Adapter**

**ORDERING INFORMATION**

**CMA 130 In Vitro Stand**

Includes:
- Stand
- In Vitro Holder, 3 pcs
- 3 Probe Clips
- Stereotaxic Adapter
- Connecting Rod for Clip
- Eppendorf tubes 1.5 mL, 25 pcs

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMA 8309102</td>
<td>with CMA 11+12 Clips x 3</td>
</tr>
<tr>
<td>CMA 8309103</td>
<td>with Mixed Clips: CMA 11+12 Clip x 2 and CMA Probe Shaft Clip x 1</td>
</tr>
<tr>
<td>CMA 8309104</td>
<td>with CMA 7 clips x 3</td>
</tr>
</tbody>
</table>

**Accessories**

- **CMA 7 Clip**
- **CMA 11 + 12 Clip**
- **CMA Probe Shaft Clip**
- **Connecting Rod for Clip**
- **Stereotaxic Adaptor**
CMA 400 Syringe Pump
Four-syringe liquid delivery

ORDERING INFORMATION

CMA 400 Syringe Pump

Ref. No.
CMA 8002020

The pump is delivered without syringes. 1-10 mL syringes available (see page 35).

TECHNICAL INFORMATION

Number of syringes: 1 to 4
Syringe sizes: Pre-calibrated for piston stroke
60 mm, 10, 25, 50, 100, 250, 500 µL, 1, 2.5, 5
and 10 mL. Others can be user defined.
Flow rate range: 1 nL/min - 1 mL/min
Injection volume: 1 nL - 10 mL
Calibration: Automatic or Self adjusting calibration
Accuracy: ± 1%
Reproducibility: ± 0.1 %
(with recommended syringe)
Memory: Non - volatile. Stores all settings
External connections: General purpose digital
Input/Output
Computer connection: RS 232 serial interface
Voltage: 100 - 240 VAC, 50 - 60 Hz
Size: 233 x 226 x 86 mm (W x D x H)
Weight: Approx 4 kg

Intended use: Designed for research and industrial applications, the CMA 400 Syringe Pump is not approved for clinical use.

THE CMA 400 SYRINGE PUMP is a multifunctional, easy to use pulse-free pump. It has a broad flow rate range of 1 nL/min to 1 mL/min and can hold up to four syringes. The pump can be used for continuous delivery or withdrawal of liquids or for microinjections of preset volumes from 1 nL to 10 mL. Injections can also be repeated in intervals.

The pump is pre-calibrated for glass syringes from 10 µL to 10 mL but other syringes can be used; No recalibration is necessary.

The pump is equipped with RS-232/digital IO interface for connection to the customer's own software.
CMA 402 Syringe Pump
Dual syringe perfusions

ORDERING INFORMATION

CMA 402 Syringe Pump
Ref. No.
CMA 402 Syringe Pump
CMA 8003100
with Accessory Kit
Includes:
- Microsyringes 1mL, 2 pcs
- Vial Holders, 2 pcs
- CMA 11+12 Clip
- CMA Probe Shaft Clip
- Micro T Eppendorf tubes 1.5 mL 10 pcs
- Microdialysis CAD Software

CMA 402 Microdialysis Pump
CMA 8003110
Includes:
- Microdialysis CAD Software

TECHNICAL INFORMATION

Syringes: Piston stroke 60 mm, 1, 2.5 or 5 mL
Flow rate range: 0.1 µL - 20 µL/min
Flush flow rate: Approx 20 µL/min
(with 1 mL syringe)
Piston carriage speed: 2.4 µm/min- 1.2 mm/min
Motor: High resolution step motor system
Calibration: Automatic or self-adjusting calibration
Accuracy: ±1.5%
Speed variation: ±1.5%
Voltage: Input 100 - 240 VAC, 50 – 60 Hz, output 12 VDC (adapter included)
Computer connection: RS-232 and USB interface
Size: 207 x 135 x 48 mm
Weight: 1.4 kg

* Dual syringes independently controlled  * Flow rates from 0.1- 20 µL/min
* Independent flow directions to infuse or withdraw  * Microdialysis CAD software included

THE CMA 402 SYRINGE PUMP is a compact, flexible, dual syringe pump designed for low pulse-free flow rates suitable for microdialysis experiments and other low flow experiments. Start/Stop and flow rate can be set individually for each syringe. The pump is precalibrated for 1, 2.5 or 5 mL syringes with flow rates between 0.1 µL/min and 20 µL/min. The flow rates are shown on the LED displays. The CMA 402 Microdialysis Pump is even more flexible when controlled by a computer through the RS-232 interface. For instance, a preset volume can easily be set. A flush feature fills the system at a flow rate of 25 µL/min. The CMA 402 is available in two different versions, one of which includes accessories such as vial holders and probe clips, allowing easier handling of the microdialysis probe.
CMA 402 Microdialysis CAD Software

to control the microdialysis experiment

Microdialysis CAD
A tool for microdialysis research

- Run a dose response experiment
- Introduce a potassium pulse
- Exclude calcium from the perfusate
- Perfuse your tissue with varying concentrations of a substance in order to determine its extra-cellular concentration (the Lönroth method) or...
- Determine the tissue concentration by changing the flow and then extrapolating to zero
- Run a “flow response” experiment to find the optimal perfusion flow
- Make a local injection in one area of the brain and record the change in release in another area
- Infuse a drug i.v. and follow the build up of a steady state drug concentration in the brain
- Repeatedly inject a drug and follow the development of tachyphylaxis
- Flush the system to remove air, lower your flow, wait for steady state and then inject your drug
- Run two microdialysis experiments simultaneously
- Lower the pH of the perfusate as soon as it leaves the microdialysis probe to avoid degradation by injecting HCl from the second syringe through a T-connector
- Don’t worry about having to remember internal volumes or when to change samples in order to match your drug injection or potassium pulse etc.

For more product information on the CMA 402 Microdialysis Pump, see page 33 and for information on the CMA 142 Microfraction Collector, see page 37.

FIG. 1
The CMA 402 Syringe Pump and the CMA 142 Microfraction Collector can be controlled by the Microdialysis CAD Software.

FIG. 2
Simply enter experimental values and choose one of six experimental set ups.

FIG. 3
The Microdialysis CAD screen where the experiment is planned. Simply click on the graph to enter perfusion flow rates, concentration gradients, fraction collection, and experimental events.

MICRODIALYSIS CAD SOFTWARE, bundled with the CMA 402 Syringe pump, allows for endless design variations of a Microdialysis experiment. Microdialysis CAD software enables one to plan the experiment, execute it automatically, and save the setup in a report protocol for future use.

Program concentration gradients, pulses, injections, and fraction times, all in the MS Windows® environment. This is especially useful during behavioral experiments when the animal must not be disturbed. Look at the list of possibilities that can be accomplished using this software tool for Microdialysis research.
**MICROSYRINGES (FIG. 1)** 1, 2.5, 5 and 10 mL Microsyringes, glass syringes with a 60 mm piston stroke. Syringe Needles are pretreated to reduce degradation of labile molecules, such as catecholamines and their metabolites during a microdialysis experiment.

**SYRINGE CLIP (FIG. 2)** The Syringe Clip enables the withdrawal of liquids when using either the CMA 400 or the CMA 402 Syringe Pumps. The clip fastens the syringe plunger to the carriage of the pump.

**MICRO T (FIG. 3)** The Micro T is a three-way connector. Connected to the syringes in the CMA 402 Syringe Pump and a Microdialysis probe, two different perfusion fluids can be combined, even gradually, without introducing air bubbles into the system.

With the Micro T and the CAD program there are a lot of possibilities. See previous page.

### ORDERING INFORMATION

**CMA 400 and CMA 402 Syringe Pump Accessories**

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMA 8309020</td>
<td>Microsyringe 1 mL, glass</td>
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<tr>
<td>CMA 8309021</td>
<td>Microsyringe 2.5 mL, glass</td>
</tr>
<tr>
<td>CMA 8309022</td>
<td>Microsyringe 5 mL, glass</td>
</tr>
<tr>
<td>CMA 8309023</td>
<td>Microsyringe 10 mL, glass*</td>
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<tr>
<td>CMA 7431083</td>
<td>Syringe Needle, 5/pkg</td>
</tr>
<tr>
<td>CMA 3408310</td>
<td>Syringe Clip, Medium, 1-2.5 mL syringe</td>
</tr>
<tr>
<td>CMA 3408320</td>
<td>Syringe Clip, Large*, 5-10 mL syringe</td>
</tr>
<tr>
<td>CMA P000043</td>
<td>Micro T**</td>
</tr>
</tbody>
</table>

* For use with CMA 400 Syringe Pump
** For use with CMA 402 Syringe Pump
CMA 110 Liquid Switch
Switching perfusion lines

ORDERING INFORMATION

CMA 110 Liquid Switch
Ref. No.
Includes:
Tubing Kit

Accessories
CMA 110 Tubing Kit

TECHNICAL INFORMATION

CMA 110 Liquid Switch
Size: 66 x 46 x 50 mm
Weight: 0.13 kg
Internal volume: Inlet side 1.7 μL, Outlet side 1.7 μL

* Instantly switch between syringes
* No interruption of flow
* Prevent introduction of air bubble

THE CMA 110 LIQUID SWITCH permits manual switching between up to three perfusion lines (syringes) and a microdialysis probe. This makes it possible to change different solutions instantaneously without any risk of introducing air bubbles into the microdialysis probe.
THE CMA 142 MICROFRACTION COLLECTOR is a unique, stand-alone instrument dedicated for microdialysis sampling. Fractions ranging from 1 to 50 µL can be collected from one or two microdialysis probes (1 x 20 or 2 x 10 samples respectively). The low noise cassette movement prevents any distress to experimental animals, and the size of the instrument (130W x 80H x 100D mm) permits placement close to the experiment without long connection tubing.
CMA 470 Refrigerated Fraction Collector
for collecting samples up to four fractions simultaneously

ORDERING INFORMATION

CMA 470 Refrigerated Fraction Collector
Ref. No.

Includes:

- 4 Cassettes for Small Vials
- Holder for Single Cannula
- Holder for Dual Cannulae
- Holder for Quadruple Cannulae
- 4 Cannulae for Tubing
- 4 Cannulae for Septa

Accessories

<table>
<thead>
<tr>
<th>Item</th>
<th>Ref. No.</th>
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<tbody>
<tr>
<td>Vials, Plastic 300 µL (1000/pkg)</td>
<td>CMA 7431100</td>
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<tr>
<td>Caps, Plastic (1000/pkg)*</td>
<td>CMA 7431101</td>
</tr>
<tr>
<td>Vials, Glass 300 µL 500/pkg</td>
<td>CMA 7431007</td>
</tr>
<tr>
<td>Caps/Seals Non-Reclosing, Small, 1000/pkg</td>
<td>CMA 7432175</td>
</tr>
<tr>
<td>Crimper, Small</td>
<td>CMA 7432017</td>
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<tr>
<td>Cassette, Small Vials, Plastic</td>
<td>CMA 8320010</td>
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<tr>
<td>Cassette, Large Vials, Aluminum</td>
<td>CMA 8320008</td>
</tr>
<tr>
<td>Cannula for Tubing</td>
<td>CMA 80029999</td>
</tr>
<tr>
<td>Cannula for Septa</td>
<td>CMA 8003000</td>
</tr>
</tbody>
</table>

* Not for use in the Fraction Collector.

TECHNICAL INFORMATION

Collection: 1 µL - 1.2 mL
Number of vials: 64 x 300 µL, 40 x 2.0 mL
Septa: Non-Reclosing
Cooling: Down to +6 °C, in steps of 1 °C
Cooling capacity: -15 °C from environmental temperature or better
Temperature accuracy: ±1.5 °C
Collection modes: Time, minutes and seconds
Computer connection: RS232 Serial Interface and USB
Voltage: 100-240 VAC, 50-60 Hz
Size: 222 x 279 x 142 (167) mm (WxDxH)
Weight: Approx. 3.8 kg

* Fractions cooled down to +6 °C * Fractions from 1 to 1200 µL * Holds up to 64 vials
* Optional collection into four vials simultaneously

THE CMA 470 REFRIGERATED FRACTION COLLECTOR is specifically designed to collect microliter volume fractions typical of microdialysates. It has thermoelectric cooling down to +6 °C and the fractions can be collected in sealed vials. Both of these are important considerations for the prevention of evaporation and chemical degradation. It is possible to collect fractions as small as 1 µL at the bottom of each vial. The capacity of the collector is 64 vials of 300 µL each or 40 vials of 2 mL each. Equipped with a quadruple assembly, the CMA 470 can collect fractions from up to four probes simultaneously. There is also an option to collect samples into open vials.

The fraction collector is a stand alone instrument, but it is equipped with a digital Input/Output port and an RS-232 interface for connection to the customer's own software.
CMA 450 Temperature Controller
for rat and for mouse

ORDERING INFORMATION

CMA 450 Temperature Controller
includes:
Rectal Probe, Heating Pad, and Insulation Pad

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>CMA 450 for Rat</th>
<th>CMA 450 for Mouse</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMA 8003760</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CMA 8003770</td>
<td></td>
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</tbody>
</table>

Accessories

<table>
<thead>
<tr>
<th>Ref. No.</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>CMA 8003761</td>
<td>CMA 450 Rectal Probe for rat Ø 2.0 mm</td>
</tr>
<tr>
<td>CMA 8003762</td>
<td>CMA 450 Rectal Probe for mouse Ø 1.3 mm</td>
</tr>
<tr>
<td>CMA 8003763</td>
<td>CMA 450 Heating Pad</td>
</tr>
<tr>
<td>CMA 8003764</td>
<td>CMA 450 Insulation Pad</td>
</tr>
</tbody>
</table>

TECHNICAL INFORMATION

- Automatic cut-out switch prevents overheating
- Maintains constant body temperature
- Accuracy of ±0.2 °C

THE CMA 450 TEMPERATURE CONTROLLER monitors and regulates the body temperature of small animals under anesthesia. The control unit displays actual temperature measured by a rectal thermometer and regulates power to the heating pad which warms the animal. Temperature variation from a preset value lies within a range of ±0.2 °C. The controller can maintain body temperature from +34 to +43 °C. The dimensions of the heating pad are 200 x 120 cm.

The Temperature Controller is available in two versions. One is suitable for rats and guinea pigs with a rectal probe OD 2 mm, and one is suitable for mice and hamsters with a rectal probe OD 1.3 mm. Both are made of flexible material, gentle on the animal.

Operating mode:
Power applied to the heating pad. Pad temperature continuously controlled by rectal probe.

Heating Pad, max. temp.: +46 °C
Temperature accuracy: ±0.2 °C
Temperature range: 34 - 43 °C
Size, Control Unit: 145 x 150 x 70 mm
Pad size: 200 x 120 mm
Probe size for rat: 2.0 x 95 mm, cable length 1.5 meter
Probe size for mouse: 1.3 x 50 mm, cable length 1.5 meter
Weight, control Unit: 0.8 kg
Voltage: 100 - 240 V, 50/60 Hz
Stereotaxic Equipment

ORDERING INFORMATION

New Standard Stereotaxic Instruments

<table>
<thead>
<tr>
<th>Description</th>
<th>Ref. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>New Standard Stereotaxic for Rats and Mice, Model 51500</td>
<td>CMA 72-6335</td>
</tr>
<tr>
<td>Dual New Standard Stereotaxic for Rats and Mice, Model 51503</td>
<td>CMA 72-6336</td>
</tr>
<tr>
<td>Digital New Standard Stereotaxic for Rats and Mice, Model 51500D</td>
<td>CMA 72-6338</td>
</tr>
<tr>
<td>Digital Dual New Standard Stereotaxic for Rats and Mice, Model 51503D</td>
<td>CMA 72-6339</td>
</tr>
<tr>
<td>Motorized New Standard Stereotaxic for Rats and Mice, Model 51503M</td>
<td>CMA 72-6340</td>
</tr>
<tr>
<td>New Standard Stereotaxic for Rats and Mice (no manipulator arm), Model 51500</td>
<td>CMA 72-6337</td>
</tr>
</tbody>
</table>

- Revolutionary vertically-adjusted ear and nose bar posts
- Revolutionary horizontally-adjusting ear and nose bar posts
- Designed for both rats and mice all on the same base
- No U-frame, maximizes operating space
- Traditional and non-traumatic rat ear bars

THE NEW STANDARD STEREOTAXIC INSTRUMENTS are ideal for researchers working with rats and mice. They have larger laser engraved vernier scales (accurate to 100 um), 80 mm of ventral-dorsal, medial-lateral and anterior-posterior travel, absolute lock at 90° ventral-dorsal and brass-bushings for electrical grounding. The New Standard Stereotaxic Instruments include mouse ear bars, a mouse and rat nose adaptor as well as dual tip rat ear bars; one side is 18° and the other side is 45°.

The New Standard Stereotaxic is available in manual, digital and motorized versions.
The Just for Mouse™ Stereotaxic Instruments is ideal for researchers working with mice and other small rodents. Precision alignment when using the Just for Mouse™ Stereotaxic ensures accurate placement of electrodes, micropipettes, cannula and other devices.

Advanced digital and motorized versions include a zeroing function allowing the user to target specific coordinates in the brain for injection, implantation, etc. Calculation of distance measurements is thus no longer necessary.

The Just for Mouse™ Stereotaxic Equipment is available in manual, digital and motorized versions.

* Ear and tooth bar adjustment to accommodate animals between 10 and 75 grams.

* Delrin® Ear bars with 3 types of head holders.

### ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Just for Mouse™ Stereotaxic Instruments</th>
<th>Ref. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Just for Mouse™ Stereotaxic</td>
<td>CMA 72-9564</td>
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<tr>
<td>Model 51730</td>
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<tr>
<td>Dual Just for Mouse™ Stereotaxic</td>
<td>CMA 72-9565</td>
</tr>
<tr>
<td>Model 51733</td>
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<tr>
<td>Digital Just for Mouse™ Stereotaxic</td>
<td>CMA 72-9563</td>
</tr>
<tr>
<td>Model 51730D</td>
<td></td>
</tr>
<tr>
<td>Digital Dual Just for Mouse™ Stereotaxic</td>
<td>CMA 72-9566</td>
</tr>
<tr>
<td>Model 51733D</td>
<td></td>
</tr>
<tr>
<td>Motorized Just for Mouse™ Stereotaxic</td>
<td>CMA 72-9567</td>
</tr>
<tr>
<td>Model 51730M</td>
<td></td>
</tr>
</tbody>
</table>
THIS MICRO DRILL is a workhorse in a kit. This versatile powerhouse is ideal for milling, drilling, grinding and cutting. This drill quickly cuts through bone and other materials. It may also be used for general purpose work such as removing coatings, cutting, drilling holes, cutting slots, as well as performing many other procedures using various interchangeable bits. Unlike most hand-held tools, the Micro Drill has a tiny, high speed DC motor in the hand piece, eliminating bothersome drive cables and giving the researcher better control. A separate power supply keeps the hand piece lightweight and reduces fatigue. Power is supplied by a panel switch or foot switch for ease of use.

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>Bone Micro Drill System</th>
<th>Ref. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Complete Bone Drill System 120 VAC</td>
<td>CMA 72-4950</td>
</tr>
<tr>
<td>Complete Bone Drill System 230 VAC</td>
<td>CMA 72-4951</td>
</tr>
<tr>
<td>Accessory Kit for Micro Drill (see below*)</td>
<td>CMA 72-4967</td>
</tr>
</tbody>
</table>

**Abrading Tip**
- Rubber, pkg. of 20
  - Ref. No. CMA 72-4952
- Stone, pkg. of 5
  - Ref. No. CMA 72-4953

**Accessory Stand**
- Ref. No. CMA 72-4954

**Ball Mill, Carbide, pkg. of 5**
- #1, .031 in Diameter
  - Ref. No. CMA 72-4955
- #2, .039 in Diameter
  - Ref. No. CMA 72-4956
- #3, .047 in Diameter
  - Ref. No. CMA 72-4957
- #4, .055 in Diameter
  - Ref. No. CMA 72-4958
- #5, .063 in Diameter
  - Ref. No. CMA 72-4959
- #6, .071 in Diameter
  - Ref. No. CMA 72-4960
- #7, .083 in Diameter
  - Ref. No. CMA 72-4961
- #1/4, .019 in Diameter
  - Ref. No. CMA 72-4962
- #1/2, .027 in Diameter
  - Ref. No. CMA 72-4963

**Cutoff Disk, pkg. of 20**
- Ref. No. CMA 72-4964

**Mandrel, Screw, pkg. of 5**
- Ref. No. CMA 72-4965

**Mandrel, Threaded, pkg. of 5**
- Ref. No. CMA 72-4966

**Extra Large Probe Holder for attachment of hand piece to stereotax**
- Ref. No. CMA 72-4860

**Accessory Kit Includes (CMA 72-4967):**
- Abrading Tip, Rubber, Qty. 4
- Abrading Tip, Stone, Qty. 1
- Accessory Stand, Qty. 1
- Ball Mill, Carbide, #1-7
- Ball Mill, Carbide, #1/4
- Ball Mill, Carbide, #1/2
- Cutoff Disk
- Mandrel, Screw
- Mandrel, Threaded

*Dental quality construction for delicate work*
*Flexible telephone-style cord eliminates bothersome drive cables*
*Quick change chuck for easy bit replacement*
*Versatile forward, reverse, and variable speeds*
*Small, lightweight, ergonomically designed hard piece reduces fatigue*
*Complete - includes ball mills, abrasive bits, and cutting discs*
Cordless Clipper and Skin Tunneling Needles

**CHROMINI CORDLESS CLIPPER** is ideal for removing fine hair from laboratory animals without hurting delicate skin. It combines unbeatable cutting performance and cordless operation. This permits you to achieve the results that professionals demand. The Clipper features a superior quick detachable blade. This clipper comes complete with rechargeable/cordless trimmer, charger stand, detachable #30 blade, cleaning brush, oil, snap on guide comb, and instruction book.

**SKIN TUNNELING NEEDLES** provide a quick and easy method of making subcutaneous tunnels in research animals for routing catheters and electrode leads to convenient exterior sites. They are constructed of tempered heavy wall stainless steel tubing and come with semi-blunt 45° bevel points. The needles are made with a through-hole in the handle, which is a continuation of the needle lumen, to allow catheter feed-through. For bundles of catheters and electrode leads that are too large for the lumen of the needles, suture wire can be passed through the needles and used to pull the bundles through the subcutaneous tunnel. Supplied in a set of 3.

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>Product</th>
<th>Ref. No.</th>
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<tbody>
<tr>
<td>ChroMini Cordless Clipper</td>
<td>CMA 72-9063</td>
</tr>
<tr>
<td>ChroMini Cordless Clipper, 115 VAC, 60 Hz</td>
<td>CMA 72-9063</td>
</tr>
<tr>
<td>Replacement #30 Blade, for 72-9063</td>
<td>CMA 72-9064</td>
</tr>
<tr>
<td>ChroMini Cordless Clipper, 230 VAC, 60 Hz</td>
<td>CMA 34-1414</td>
</tr>
<tr>
<td>Replacement #30 Blade, for 34-1414</td>
<td>CMA 34-1418</td>
</tr>
<tr>
<td>Skin Tunneling Needles</td>
<td>CMA 72-0680</td>
</tr>
<tr>
<td>OD x ID: 3.2 x 25 mm (1/8 x 1/10 in)</td>
<td>CMA 72-0680</td>
</tr>
<tr>
<td>Lengths: 15.2, 22.9, 30.5 cm (6, 9, 12 in)</td>
<td>CMA 72-0679</td>
</tr>
<tr>
<td>OD x ID: 4.8 x3.2 mm (3/16 x 1/8 in)</td>
<td>CMA 72-0679</td>
</tr>
<tr>
<td>Lengths: 22.9, 30.5, 40.6 cm (9, 12, 16 in)</td>
<td>CMA 72-0679</td>
</tr>
</tbody>
</table>
Harvard Apparatus Line of Surgical Instruments
Minor and Major Surgical Kits

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Minor Surgery Surgical Kit</th>
<th>Ref. No.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Minor Surgery Surgical Kit</td>
<td>CMA 72-8940</td>
</tr>
<tr>
<td>Scalpel Handle No. 3</td>
<td>CMA 72-8350</td>
</tr>
<tr>
<td>Scalpel Blades No. 10, Sterile</td>
<td>CMA 72-8360</td>
</tr>
<tr>
<td>Eye Scissors, 11.5 cm Curved, Special Cut</td>
<td>CMA 72-8441</td>
</tr>
<tr>
<td>Blumenthal Bone Rongeurs, Curved, 15.5 cm</td>
<td>CMA 72-8906</td>
</tr>
<tr>
<td>Universal Clothing Scissors</td>
<td>CMA 72-8450</td>
</tr>
<tr>
<td>Operating Scissors, 14.5 cm Sharp/Blunt, Straight</td>
<td>CMA 72-8393</td>
</tr>
<tr>
<td>Kuehne Cover Glass Forceps, 10 cm, Angled</td>
<td>CMA 72-8676</td>
</tr>
<tr>
<td>Jeweller’s Forceps 11 cm, No. 5 with Extra Delicate Points</td>
<td>CMA 72-8696</td>
</tr>
<tr>
<td>Probe 14.5 cm Double Ended, 1 mm Diameter</td>
<td>CMA 72-8912</td>
</tr>
</tbody>
</table>

HARVARD APPARATUS SURGICAL INSTRUMENTS are forged and finished in a German ISO 9001 facility. These superior quality tools are highly resistant to corrosion and maintain their sharp cutting surfaces for a long time. You can purchase these surgical instruments individually or in a convenient kit.

MINOR SURGERY SURGICAL KIT is ideally suited for basic procedures and minor surgery.
**DELUXE MAJOR SURGICAL KIT** is ideally suited for more extensive procedures and major laboratory animal surgeries.
HARVARD APPARATUS SURGICAL INSTRUMENTS are forged and finished in a German ISO 9001 facility. These superior quality tools are highly resistant to corrosion and maintain their sharp cutting surfaces for a long time. You can purchase these surgical instruments individually or in a convenient kit.

RAT SURGICAL KIT is an ideal starting point for surgical procedures commonly performed on laboratory rats.
Harvard Apparatus Line of Surgical Instruments

Mouse Surgical Kit

ORDERING INFORMATION

<table>
<thead>
<tr>
<th>Item Description</th>
<th>Ref. No.</th>
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<tbody>
<tr>
<td>Mouse Surgical Kit</td>
<td>CMA 72-8943</td>
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<tr>
<td>This kit consists of:</td>
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<tr>
<td>Disposable Scalpels with Plastic Handle No. 11, Sterile, Box of 10</td>
<td>CMA 72-8372</td>
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<tr>
<td>Jeweller's Forceps No. 5, 11.0 cm with Extra Delicate Points</td>
<td>CMA 72-8696</td>
</tr>
<tr>
<td>Vannas Eye Scissors, 8.5 cm Straight Spring Action</td>
<td>CMA 72-8503</td>
</tr>
<tr>
<td>Graefe Iris Forceps Serrated, 10.0 cm, Curved Points 0.7 mm</td>
<td>CMA 72-8604</td>
</tr>
<tr>
<td>Eye Scissors 10.5 cm, Straight Barraquer (Colibri) Eye Specula, Small</td>
<td>CMA 72-8426</td>
</tr>
<tr>
<td>Derf Needle Holders, 12.0 cm Probe, 14.5 cm Double Ended, 1 mm Diameter</td>
<td>CMA 72-8918</td>
</tr>
</tbody>
</table>

HARVARD APPARATUS SURGICAL INSTRUMENTS are forged and finished in a German ISO 9001 facility. These superior quality tools are highly resistant to corrosion and maintain their sharp cutting surfaces for a long time. You can purchase these surgical instruments individually or in a convenient kit.

MOUSE SURGICAL KIT is ideal starting point for surgical procedures performed on laboratory mice.
General Information

Customer Support
Internet Support
US Office and Distributors
**Training Course**

**Microdialysis Training Courses**

Introductory courses on Microdialysis are organized for those who are about to start or have just started using the technique.

The course program includes both lectures on Microdialysis and practical demonstrations. Participants will gain a general overview of the Microdialysis technique, its advantages, and limitations. In basic research practical classes can be organized to conduct experiments under the leadership of highly qualified instructors.

This is also an excellent opportunity for open discussions and an exchange of ideas while meeting with other scientists, and experts in the field.

Course program and upcoming dates can be found on www.microdialysis.com

---

**Customer Support**

For general information about the technique and for more information regarding our products you are welcome to contact us or the CMA distributor in your area.

We have a skilled staff available to solve your technical problems if an equipment oriented problem should arise.

Obtain a return authorization number from either your local CMA Representative or CMA Service before you return any products for repair.

A detailed description will help minimize cost and turnaround time.

Visit www.microdialysis.com for the latest technical support and service information.

---

<table>
<thead>
<tr>
<th>Support and Technical Service</th>
<th>Head Office</th>
<th>US Office</th>
</tr>
</thead>
<tbody>
<tr>
<td>Phone: +46-8-470 10 00</td>
<td>Phone: (508) 893-8999</td>
<td></td>
</tr>
<tr>
<td>Fax:  +46-8-470 10 50</td>
<td>Fax: (508) 429-5732</td>
<td></td>
</tr>
<tr>
<td>Email: <a href="mailto:cma@microdialysis.se">cma@microdialysis.se</a></td>
<td>Email: <a href="mailto:techsupport@harvardapparatus.com">techsupport@harvardapparatus.com</a></td>
<td></td>
</tr>
</tbody>
</table>
Sweden Office

CMA Microdialysis AB
(Head Office)
Box 2
SE-171 18 Solna
Sweden

Phone: +46 8 470 10 00
Fax: +46 8 470 10 50
E-mail: cma@microdialysis.se
Website: www.microdialysis.com

Visiting address:
Dalvägen 10, Solna
Delivery address:
Pyramidvägen 9A, 169 56 Solna

The head office of CMA Microdialysis is located on the grounds of an industrial park in Solna, Sweden close to the Karolinska Institute.

US Office

Harvard Apparatus
84 October Hill Road
Holliston
MA 01746, USA

Phone: (508) 893-8999
Fax: (508) 429-5732
E-mail: bioscience@harvardapparatus.com
Website: www.harvardapparatus.com
Exploring Tissue Chemistry

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E-mail: cma@microdialysis.se

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E-mail: techsupport@harvardapparatus.com

www.microdialysis.com
www.harvardapparatus.com