products for microdialysis
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## Microdialysis for Advanced Use

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OUR VISION

“Microdialysis based research and diagnostics leads to improved quality of life”

THE COMPANY

CMA Microdialysis is a Swedish medical device 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, consumables and computer software are sold globally to universities, hospitals and pharmaceutical companies as unique tools for in vivo sampling and monitoring of organs and tissues.

CMA is the leading company developing and marketing Microdialysis products for the scientific & medical research field. Since 1994, CMA also offers unique Microdialysis products for clinical research and diagnostics. The products are produced in Sweden under ISO 13485 and according to FDA standards.

With a highly specialized and skilled staff, consumables are manufactured in a Class 8 clean room environment. The head office is located outside Stockholm, Sweden, with subsidiaries in Germany and the USA. 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, see Microdialysis technique. The first paper on Microdialysis was published in 1974. Since then, more than 12,000 scientific papers have been published on the technique - among them some 2,000 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 towards improved spatial resolution and ease of use, as well as 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 as well as a diagnostic tool in the clinic. 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 for basic research, clinical research and clinical diagnostics. The basic research portfolio includes a broad range of probes, pumps, fraction collectors, analyzers and complete systems for advanced research.

The clinical product range includes catheters and analyzers cleared for human use. The system is used for monitoring the human brain, subcutaneous and intramuscular use and continuous monitoring and detection of local changes in metabolism following gastrointestinal and hepatic surgery.

Intravenous Microdialysis offers novel opportunities for continuous monitoring of small substances in blood. By using an optimized membrane, CMA catheters can be implanted into peripheral veins for up to 3 days, with very high accuracy.

The massive amount of data generated by Microdialysis and other complementary techniques can be analyzed by CMA's extraordinary computer software LABpilot and ICUpilot. They introduce the new concept of “Data Navigation” where data can be displayed and manipulated in a graphic environment. ICUpilot enables the complete bedside integration of all physiological, chemical and pharmacological data as unparalleled decision support for the medical professional.

**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 in vivo, within specific tissues.**

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

**CLINICAL APPLICATIONS**

In the clinic, Microdialysis is used to address various issues in different clinical fields, such as monitoring for early detection of secondary brain injuries, flap thrombosis, transplant rejection and anastomosis leakage. Microdialysis is also used in clinical pharmacology to measure target site concentrations of antibiotics or anticancer drugs in different tissues and organs and to subsequently relate target site PK to PD.

CMA's clinical solutions are used by leading university hospitals around the globe for continuous tissue monitoring in the ICU.

**SALES AND DISTRIBUTION**

CMA offers a complete and leading suite of Microdialysis solutions that meets the needs of advanced research. All products are produced under high quality standards and in a clean 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 a continuous development and improvement of our instruments is guaranteed.

Global support comes from the CMA Microdialysis home office located in Stockholm Sweden, a branch office located in Boston (responsible for the USA, Canada, and South America), and many knowledgeable distributors in Europe, Asia and Australia.

**REGULATORY APPROVALS AND ISO 13485**

CMA Microdialysis was one of the first medical technology companies to certify a product according to the Medical Device Directive (MDD). The first Microdialysis catheter was approved for CE marking in 1995. All products are produced in Sweden under rigorous quality control under the ISO13485 accreditation.
Microdialysis for Basic Research

Microdialysis Probes

Microdialysis Instruments
Microdialysis for Basic Research

The Principle of Microdialysis

Microdialysis is a technique 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 proximal end of the probe.

In the sterile microdialysis catheters, the direction of flow is often the opposite in order to minimize the dead volume between the membrane and the collection microvial. 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/time unit) 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 for Basic Research

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 large substances, such as peptides or proteins.

2. LENGTH OF THE MEMBRANE
A longer membrane yields a better recovery of the substances you are interested in, 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 time unit 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 time period. An hour 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 difficulties 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.

Many, or all, of the points above are well known to the experienced scientist. However, the intention of this page is to lay the groundwork for successful microdialysis experiments.
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 pc/pkg, or 4 pc/pkg, and each probe is guaranteed for 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.

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

**CMA 11 + guide cannula**
- For use in discrete brain regions
- High spatial resolution
- Causes minimal tissue damage
- Available membrane: Cuprophane, 6kD MWCO
- Membrane lengths - 1, 2, 3 or 4 mm
- Membrane diameter - 0.24 mm
- Matching guide cannula

**CMA 7 + guide cannula**
- Ideal for CNS studies in small animals
- Designed for dialysis in transgenic mice
- Low internal volume
- Available membrane: Cuprophane, 6kD MWCO
- Membrane lengths - 1 and 2 mm
- Membrane diameter - 0.24 mm
- Matching guide cannula
Microdialysis Probes

**CMA 20 + introducer**
- Tailored for dialysis in peripheral tissues and blood vessels
- Inlet and outlet tubing is attached
- Soft, non-metallic construction
- Available membranes: PAES, 20kD MWCO, PES, 100kD MWCO
- Membrane lengths - 4 or 10 mm
- Membrane diameter - 0.5 mm
- Introducer included

**CMA 30 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: Cuprophane, 6kD MWCO
- Membrane lengths - 10 mm
- Membrane diameter - 0.24 mm
- Introducer included

**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, 55kD MWCO
- Membrane lengths - 10 mm
- Membrane diameter - 0.26 mm
- Introducer included

**Custom made**
- 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
- Matching guide cannula
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 two holes in 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 blue 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 adaptors (see accessories, page 18-19).

The CMA 12 Microdialysis Probes are guaranteed for single use. Complete instructions are included.

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

### TECHNICAL INFORMATION
- Stainless-steel shaft diameter: 0.64 mm
- Shaft length: 14 mm
- Membrane diameter: 0.5 mm
- Inlet internal volume: negligible
- Outlet internal volume: 3 µL

### ORDERING INFORMATION

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CMA 11 Microdialysis Probe
for discrete areas in the CNS

THE CMA 11 MICRODIALYSIS PROBE 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 adaptors (see accessories, page 18-19).

The CMA 11 Microdialysis Probes are guaranteed for single use. Complete instructions are included in each package.

ORDERING INFORMATION

CMA 11 Microdialysis Probe
3/pkg

Available membrane:
Cuprophane, 6000 Daltons cut-off

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<td>4 mm</td>
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TECHNICAL INFORMATION

- Stainless-steel shaft diameter: 0.38 mm
- Shaft length: 14 mm
- Membrane diameter: 0.24 mm
- Inlet internal volume: negligible
- Outlet internal volume: 1 µL

- Small diameter
- High spatial resolution
- Minimal tissue damage
- Low internal volume
**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.

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 matching small and lightweight guide cannula is available (see probe guides, page 18-19).

CMA 7 Microdialysis Probes are guaranteed for single use. Complete instructions are included in each package.

**ORDERING INFORMATION**

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**TECHNICAL INFORMATION**

- Stainless-steel shaft diameter: 0.38 mm
- Shaft length: 7 mm
- Membrane diameter: 0.24 mm
- Inlet internal volume: negligible
- Outlet internal volume: 0.3 µL
- 200 mm Inlet tubing (blue): 3.6 µL
- 200 mm Outlet tubing (transp.): 3.6 µL

- Extremely small
- Optimized for CNS use
- Ideal for chronic implantation
- Inlet and outlet tubing directly mounted
**CMA 20 Microdialysis Probe**

* a flexible probe for peripheral tissues

**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.

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**ORDERING INFORMATION**

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<td>9 Split Tubing/pkg</td>
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Available membranes:
- Polyarylethersulfone (PAES), 20 000 Daltons cut-off
- Polyethersulfone (PES), 100 000 Daltons cut-off

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| **CMA 20, 100 000 Daltons cut-off** | |
| 4 mm | 8309670 |
| 10 mm| 8309671 |

**TECHNICAL INFORMATION**

- **Probe length (shaft+membrane)**: 24 mm
- **Polyurethane shaft diameter**: 0.77 mm
- **Membrane diameter**: 0.5 mm
- **Inlet internal volume**: 1.4 µL
- **Outlet internal volume**:
  - 4 mm membrane: 3.2 µL
  - 10 mm membrane: 2.6 µL
  - 200 mm Inlet tubing (blue): 3.6 µL
  - 200 mm Outlet tubing (transparent): 3.6 µL

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

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*Implantation of the CMA/20 Microdialysis Probe, step by step.*
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 with the membrane. Along the membrane a thin part of the tubing remains to increase the stability and also to secure the membrane during withdrawal from the tissue. The inlet of the probe has a Luer Lock connector, which 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 and includes an introducer. The probe can be sterilized in its package with ethylene oxide and each is guaranteed for single use.

- Ideal for peripheral tissues as well as for tumors
- Soft and flexible construction
- Easy implantation
- Can be sterilized with ethylene oxide
**CMA 31 Linear Microdialysis Probe**

Ideal for peripheral tissues

**ORDERING INFORMATION**

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**TECHNICAL INFORMATION**

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**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 probe is very thin, made with a unique patented design with a 10 mm membrane, 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.

- Ideal for peripheral tissues as well as for tumors
- Soft and flexible construction
- Easy implantation
- Can be sterilized with ethylene oxide
CMA 12, CMA 11 AND CMA 7 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 drills and anchor screws (see next page) are necessary for proper fixation of the guide cannula to the skull.

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

Probe Guides

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Custom Made Probes

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

- Customer specified shaft length
- Different membrane materials
- Customer specified membrane length
- Non-metallic probes
CMA PROBE CLIPS
These clips are for use in stereotaxic work to place the probe or guide in an exact position in the tissue. The clips are also for use when preparing and testing the probe.
There are three types of clips:
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

1) Probe/Guide Clips:
a) CMA 11+12 Clip, b) CMA 7 Clip, c) CMA Probe Shaft Clip

FEP TUBING
This precise tubing with 0.12 mm inner diameter (internal volume of 1.2 µL/100 mm length) is, together with the Tubing Adaptors, ideal for safe connections of the CMA 11 and CMA 12 probes.
Microdialysis for Basic Research

Probes

Accessories

TUBING ADAPTORS
These simple but secure connectors, which swell in 70% alcohol and shrink back in air, ensure tight, zero internal volume connections of FEP Tubing to the probe, swivel, liquid switch and syringes.

ANCHOR SCREWS, TREPHINE DRILL BITS, SCREW DRILL BITS AND SCREW DRIVER SET
The use of a trephine drill in the skull bone gives a precise 2 mm hole that makes the implantation of a probe easier with less risk of tearing the membrane. Anchor screws are placed in the skull plates before cementing the guide cannula to provide extra stability to the mount. Suitable Screw Drill Bits and Screw Driver Kit for the Anchor Screws are available.

PERFUSION FLUID
This isotonic sterile perfusion fluid is specially developed for microdialysis use. T1 fluid is for use in peripheral tissues and CNS fluid is used in studies of the Central Nervous System.

SPLIT TUBING
Extra split tubing for CMA 20 probes, to be used when re-using the probes.
CMA 400 Syringe Pump

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 a digital Input/Output port and an RS-232 interface for computer control.

ORDERING INFORMATION

CMA 400 Syringe Pump

Ref. No.
8002020

The pump is delivered without syringes. 1-10 mL syringes available (see page 23).

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.

- Four syringe carriage
- Both pull and push options
- Pulse-free flow from 1 nL/min
- Injection volumes as small as 1 nL
THE 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 Syringe Pump

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

CMA 402 Syringe Pump with Accessory Kit

Includes:
- Microsyringes 1mL, 2 pcs
- Vial Holders, 2 pcs
- CMA 11+12 Clip
- CMA Shaft holder Clip
- Micro T Eppendorf tubes 1.5 mL 10 pcs
- Microdialysis CAD Software

CMA 402 Microdialysis Pump

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
Microdialysis CAD
CMA 402 software to control the microdialysis experiment

MICRODIALYSIS CAD SOFTWARE, bundled with the CMA 402 Syringe pump, allows for endless design variations of a Microdialysis experiment. Microdialysis CAD 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.

**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.

For more product information on the CMA 402 Microdialysis Pump, see page 21 and for information on the CMA 142 Microfraction Collector, see page 28.
MICROSYRINGES 1, 2.5, 5 and 10 mL Microsyringes, glass syringes with piston stroke 60 mm. Syringe Needles are pretreated to reduce degradation of labile molecules, such as catecholamines and their metabolites during a microdialysis experiment.

SYRINGE CLIP The Syringe Clip enables withdrawal of liquids with the CMA 400 and the CMA 402 Syringe Pumps. The clip fastens the syringe plunger to the carriage of the pump.

MICRO T 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 changed, even gradually, without introducing air bubbles into the system.

FIG. 1
Microsyringes

FIG. 2
Syringe Clip

FIG. 3
Micro T

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

CMA 400 and CMA 402 Syringe Pump

Accessories

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<td>8309021</td>
<td>Microsyringe 2.5 mL, glass</td>
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<td>8309022</td>
<td>Microsyringe 5 mL, glass</td>
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<td>8309023</td>
<td>Microsyringe 10 mL, glass*</td>
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<td>CMA 400 adapter for CMA 111*</td>
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<td>8002031</td>
<td>CMA RS232 PC/RJ-45 cable</td>
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* For use with CMA 400 Syringe Pump
** For use with CMA 402 Syringe Pump
CMA 110 Liquid Switch and CMA 111 Syringe Selector

**ORDERING INFORMATION**

**CMA 110 Liquid Switch**

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**CMA 111 Syringe Selector**

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**Accessories**

| CMA 110 and 111 Tubing Kit | 3408550 |
| CMA 400 Adapter, for CMA 111 | 8002030 |

**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

**CMA 111 Syringe Selector**

- Size: 100 x 100 x 70 mm
- Weight: 0.75 kg
- Power: CMA 400 Syringe Pump with CMA 400 Adapter
- Internal volume: Inlet side 1.7 µL, Outlet side 1.7 µL

**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 111 SYRINGE SELECTOR** allows automated or manual switching between one of 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 111 Syringe Selector is motor-driven and powered by the CMA 400 Syringe Pump with the use of a CMA 400 Adapter.

- Instantly switch between syringes
- No interruption of flow
- Prevent introduction of air bubble
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 31-33). The Microdialysis Probe is attached to a CMA Syringe Pump, the CMA 110 Liquid Switch or to the CMA 111 Syringe Selector 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.

ORDERING INFORMATION

CMA 120 System for Freely Moving Animals

Ref. No. 8309049

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

- Balance arm with dual channel swivel
- Secures tubing away from the animal and prevents twisting
# CMA 120 System for Freely Moving Animals accessories

## ORDERING INFORMATION

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<th>CMA 120 Instrument Table</th>
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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, which holds the flat body of the CMA 11 or CMA 12 Probes or their Guide Cannulae, the CMA Probe Shaft Clip, which holds the shaft of the CMA 11 or CMA 12 Probe, and the CMA 7 Clip which holds the body of a CMA 7 Probe or Guide Cannula. The CMA 130 can be supplied with four combinations of clips. The clip can be mounted in the stereotaxic instrument using the adapter and the connecting rod (see fig a + b).

- Lengthens probe life
- Facilitates safe storage of probes
- Simplifies calibrations, recovery tests
CMA 142 Microfraction Collector
for single/dual probe sampling

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 it to be used close to the experiment without long connection tubing.

ORDERING INFORMATION

CMA 142 Microfraction Collector

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<td>115 V</td>
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Accessories

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<td>Vials, glass 300 µL, 500/pkg</td>
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<td>Caps/Seals Non-Reclosing, Small, 1000/pkg*</td>
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* Not for use in the Fraction Collector.

TECHNICAL INFORMATION

Minimum fraction volume: **1 µL**
Maximum fraction volume: **50 µL**
Number of fractions: **1 x 20 or 2 x 10**
Size: **130 x 100 x 80 mm**
Weight: **0.57 kg**
Power: **115/230 V/50/60 Hz**

- Sampling from one or two probes
- Compact design
- Easy to use
- Precision and accuracy from 1 µL

Microdialysis CAD software included, see page 22.
THE CMA 150 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 at +37.5 °C. The controller can maintain body temperatures from +34 to +43 °C. The dimension of the heating pad is 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 3.5 mm, and one is suitable for mice and hamsters with a rectal probe OD 1.9 mm.

**TECHNICAL INFORMATION**

- Operating mode: Power is applied to the heating pad. The pad temperature is continuously controlled by the rectal probe.
- Heating Pad max. temp.: +46 °C
- Temperature accuracy: ± 0.2 °C at 37 °C
- Temperature range: 34-43 °C
- Size: 190 x 135 x 80 mm
- Pad size: 200 x 120 mm
- Probe size for rat: 2.5 x 95 mm
- Probe size for mouse: 1.9 x 12 mm (tot. L 50 mm)
- Cable length: 1 meter
- Weight: 2.5 kg
- Voltage: 110-120 V, 50/60 Hz
  220-240 V, 50/60 Hz

- Automatic cut-out switch prevents overheating
- Accuracy of ±0.2 °C at +37.5 °C
- Maintains constant body temperature

**ORDERING INFORMATION**

**CMA 150 Temperature Controller**
includes:
Heating Pad and Rectal Probe

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<td>CMA 150 Rectal Probe for rat</td>
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<td>CMA 150 Insulation Pad</td>
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</table>
**CMA 470 Refrigerated Fraction Collector**

for collecting samples up to four fractions 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 1µL 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 in open vials.

The fraction collector is a stand alone instrument but is equipped with a digital Input/Output port and an RS-232 interface for computer control.

**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
- **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
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 with adapter for CMA 111
CMA 111 Syringe Selector
CMA 470 Refrigerated Fraction Collector
Probe
CMA 150 Temperature Controller
CMA 130 In Vitro Stand

CMA 400 Syringe Pump with adapter for CMA 111
CMA 111 Syringe Selector
CMA 142 Microfraction Collector
Probe
CMA 150 Temperature Controller
CMA 130 In Vitro Stand
Microdialysis Systems and Configurations

CMA 402 Syringe Pump
CMA 110 Liquid Switch
CMA 470 Refrigerated Fraction Collector
Probe
CMA 150 Temperature Controller

Microdialysis Systems for Freely Moving Animals

CMA 400 Syringe Pump with adapter for CMA 111
CMA 111 Syringe Selector
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

CMA 400 Syringe Pump with adapter for CMA 111
CMA 111 Syringe Selector
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

CMA 402 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

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
Md CAD Software
CMA 600 Microdialysis Analyzer
for laboratory use

THE CMA 600 MICRODIALYSIS ANALYZER is an analyzer especially designed for analyzing the small volumes obtained from microdialysis catheters or probes. Reagents are available for Glucose, Lactate, Pyruvate, Glycerol, Glutamate and Urea. The analyzer uses enzymatic reagents and colorimetric measurements. The CMA 600 Microdialysis Analyzer analyzes four different analytes per sample and displays the data as trend curves on a computer screen. It is possible to monitor nine catheters or probes simultaneously. The analysis takes approximately 1.5 minutes per analyte and the results are stored immediately on the hard disk to minimize the risk of losing any data. Samples can be analyzed online or batch-wise. The batch analysis function can be used for up to 24 samples.

TECHNICAL INFORMATION

- Developed for analyzing microdialysis samples
- Works with microvolume samples and reagents
- Results are displayed as trend curves on a computer screen
- Up to four different analytes per sample
THE CMA 600 MICRODIALYSIS ANALYZER was originally developed to handle samples collected in CMA Microvials (P000001). However, with the CMA 600 Vial Adapter, it is possible to use the CMA 600 for analysis of samples collected in 300 µL plastic or glass vials.

**Methods for lower sample concentration**

In basic research, samples are generally acquired at the higher flow rates (1 - 5 µL/min) which results in lower analyte recoveries. In order to facilitate the analysis of these samples, the CMA/600 Microdialysis Analyzer can be configured to use more sensitive methods for the following analytes:

<table>
<thead>
<tr>
<th>REAGENT</th>
<th>LINEAR INTERVAL</th>
<th>SAMPLE VOLUME µL</th>
<th>REAGENT VOLUME µL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>0.1 - 25 mmol/L</td>
<td>0.5</td>
<td>14.5</td>
</tr>
<tr>
<td>Lactate</td>
<td>0.1 - 12 mmol/L</td>
<td>0.2</td>
<td>14.8</td>
</tr>
<tr>
<td>Pyruvate</td>
<td>10 - 1500 µmol/L</td>
<td>0.5</td>
<td>14.5</td>
</tr>
<tr>
<td>Glycerol</td>
<td>10 - 1500 µmol/L</td>
<td>0.5</td>
<td>14.5</td>
</tr>
<tr>
<td>Glutamate</td>
<td>1 - 150 µmol/L</td>
<td>1.0</td>
<td>5.0</td>
</tr>
<tr>
<td>Urea</td>
<td>0.5 - 25 mmol/L</td>
<td>0.5</td>
<td>14.5</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>REAGENT</th>
<th>LINEAR INTERVAL</th>
<th>SAMPLE VOLUME µL</th>
<th>REAGENT VOLUME µL</th>
</tr>
</thead>
<tbody>
<tr>
<td>Glucose</td>
<td>0.02 - 6.0 mmol/L</td>
<td>2.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Lactate</td>
<td>0.02 - 2.5 mmol/L</td>
<td>0.8</td>
<td>14.2</td>
</tr>
<tr>
<td>Pyruvate</td>
<td>2 - 300 µmol/L</td>
<td>2.0</td>
<td>13.0</td>
</tr>
<tr>
<td>Glycerol</td>
<td>2 - 500 µmol/L</td>
<td>2.0</td>
<td>13.0</td>
</tr>
</tbody>
</table>
Reagents

**Glucose**
Glucose oxidase method for analysis of microdialysates

Measuring principle
Glucose is enzymatically oxidized by glucose oxidase (GOD). The hydrogen peroxide formed reacts with phenol and 4-amino-antipyrine. This reaction is catalyzed by peroxidase (POD) and yields the red-violet colored quinoneimine. The rate of formation is measured photometrically at 530 nm and is proportional to the Glucose concentration.

\[
\text{D-Glucose} + O_2 \xrightarrow{\text{GOD}} \text{gluconolactone} + H_2O_2 \\
2H_2O_2 + \text{phenol} + 4\text{-amino-antipyrine} \xrightarrow{\text{POD}} \text{quinoneimine} + 4\text{H}_2O
\]

**Lactate**
Lactate oxidase method for analysis of microdialysates

Measuring principle
Lactate is enzymatically oxidized by lactate oxidase. The hydrogen peroxide formed reacts with 4-chlorophenol and 4-amino-antipyrine. This reaction is catalyzed by peroxidase (POD) and yields the red-violet colored quinoneimine. The rate of formation is measured photometrically at 530 nm and is proportional to the Lactate concentration.

\[
\text{L-Lactate} + O_2 \xrightarrow{\text{LOD}} \text{pyruvate} + H_2O_2 \\
H_2O_2 + 4\text{-chloro-phenol} + 4\text{-amino-antipyrine} \xrightarrow{\text{POD}} \text{quinoneimine} + 2\text{H}_2O + \text{HCl}
\]

**Pyruvate**
Pyruvate oxidase method for analysis of microdialysates

Measuring principle
Pyruvate is enzymatically oxidized by pyruvate oxidase (PyrOx). The hydrogen peroxide formed reacts with N-ethyl-N-(2-hydroxy-3-sulfopropyl)-m-toluidine (TOOS) and 4-amino-antipyrine. This reaction is catalyzed by peroxidase (POD) and yields the red-violet colored quinonedimine. The rate of formation is measured photometrically at 530 nm and is proportional to the Pyruvate concentration.

\[
\text{Pyruvate} + O_2 + \text{inorganic phosphate} \xrightarrow{\text{PyrOx}} \text{acetylphosphate} + CO_2 + H_2O_2 \\
H_2O_2 + \text{TOOS} + 4\text{-amino-antipyrine} \xrightarrow{\text{POD}} \text{quinonedimine} + 4\text{H}_2O
\]

**Glycerol**
Glycerol colorimetric method for analysis of microdialysates

Measuring principle
Glycerol is phosphorylated by adenosine triphosphate (ATP) and glycerol kinase (GK) to glycerol-3-phosphate, which is subsequently oxidized in the presence of glycerol-3-phosphate oxidase (GPO). The hydrogen peroxide formed reacts with 3,5-dichloro-2-hydroxy-benzene sulphonic acid (DCHBS) and 4-amino-antipyrine. This reaction is catalyzed by peroxidase (POD) and yields the red-violet colored quinoneimine. The rate of formation is measured photometrically at 530 nm and is proportional to the Glycerol concentration.

\[
\text{Glycerol} + ATP \xrightarrow{\text{GK}} \text{Glycerol-3-phosphate} + \text{ADP} \\
\text{Glycerol-3-phosphate} + O_2 \xrightarrow{\text{GPO}} \text{dihydroxyacetone phosphate} + H_2O_2 \\
H_2O_2 + \text{DCHBS} + 4\text{-amino-antipyrine} \xrightarrow{\text{POD}} \text{ACBS} + 2\text{H}_2O + \text{HCl}
\]
### Urea

**Measuring principle**

Urea is hydrolyzed in the presence of urease to ammonium ions and carbon dioxide. The ammonium ions react with 2-oxoglutarate in the presence of glutamate dehydrogenase (GlDH) and NADH to form glutamate and NAD\(^+\). The rate of utilization of NADH is measured photometrically at 370 nm and is proportional to the Urea concentration.

### Glutamate

**Measuring principle**

Glutamate is enzymatically oxidized by glutamate oxidase (GltOx). The hydrogen peroxide formed reacts with N-ethyl-N-(2-hydroxy-3-sulfopropyl)-m-toluidine (TOOS) and 4-amino-antipyrine. This reaction is catalyzed by peroxidase (POD) and yields the red-violet colored quinonediimine. The rate of formation is measured photometrically at 530 nm and is proportional to the Glutamate concentration.

### Analyte Concentration

<table>
<thead>
<tr>
<th>Analyte</th>
<th>Concentration</th>
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<tbody>
<tr>
<td>Glucose</td>
<td>5.55 mmol/L</td>
</tr>
<tr>
<td>Lactate</td>
<td>2.5 mmol/L</td>
</tr>
<tr>
<td>Pyruvate</td>
<td>250 µmol/L</td>
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<tr>
<td>Glycerol</td>
<td>475 µmol/L</td>
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<tr>
<td>Glutamate</td>
<td>25 µmol/L</td>
</tr>
<tr>
<td>Urea</td>
<td>13.3 mmol/L</td>
</tr>
</tbody>
</table>

The CMA 600 Microdialysis Analyzer uses enzymatic reagents that are commonly used in clinical chemistry.

At present reagents for glucose, lactate, pyruvate, glycerol, glutamate and urea are available. The assays are based on kinetic measurements in order to get the analytical results as soon as possible instead of waiting for the enzymatic reaction to reach completion, which may take several minutes. The absorbance change during the first 30 s of the reaction is monitored and the maximal reaction rate during this time is used for quantification.

A single multicomponent calibrator, containing known concentrations of the different analytes is used for calibrating the assays. Since the reaction rate is proportional to the analyte concentration, quantification is done by comparing the calculated slope of the obtained absorbance versus time curve with that obtained from measuring the calibrator solution with its known analyte concentrations.
LABpilot™ is designed to handle bioscience data collected over time. Integrate and synchronize microdialysis data (including CMA600 results) from several subjects with behavioral and other recordings and/or drug dose curves to quickly assess effects. The program's graphical interface allows for faster data interpretation. Simply copy MS Excel files and paste or drag directly onto the LABpilot™ window to instantaneously generate graphs. Just one click can transform data from real time to elapsed time, from absolute values to percent values, view data as regression plots, display means, medians, SEM or SD.

LABpilot™ is designed for working with a graphical interface. LABpilot™ facilitates processing a large number of data using graphs – not numbers. Display, compare, comment and interpret the data.

• Easy to handle graphical interface
• Allows for faster data interpretation
• Display, compare, comment and interpret graphs
• Allows for easy collaboration and communication

ORDERING INFORMATION

LABpilot™ Software
Ref. No.

LABpilot™ Software
P000157
Microdialysis for Advanced Use

Portable Microdialysis Pumps
Sterile Microdialysis Catheters
The ability to diagnose a disease or condition prior to the onset of clinical signs would markedly change the way medicine is practiced today and ultimately drive the improvement of patient care. Monitoring tissue chemistry and diagnosis based on changes in the local metabolism offer windows of opportunities that may lead to improved quality of life.

And perhaps in the center of just such a new paradigm in clinical diagnosis and management might be the technique of microdialysis; it has the potential to be routinely used to monitor chemical events in live intact tissues in the same manner that we monitor physiological events.

The idea is simple: a thin dialysis tube is introduced into the tissue and perfused with a physiological salt solution. Chemicals diffuse over the membrane and the perfusate gradually equilibrates with the composition of the interstitial fluid— analogous to a capillary perfused with blood.

The technique of microdialysis has advanced well beyond its first application in the brain tissue of small rodents, and is continually finding new applications in larger animals. Parts of the advanced system include: sterile microdialysis catheters (a), small battery driven microdialysis pumps (b), specialized collection vials (c), and a chemical analyzer (d) that can measure markers of cellular damage as well as substances related to energy metabolism. These analyte levels can then be displayed on a screen within minutes.

Today this system is being used throughout the world for research as well as for routine monitoring of the human brain in neurointensive care, hepatic tissue following liver transplantation and free flaps following reconstructive surgery. In Europe, microdialysis instruments are CE labeled according to the Medical Device Directive (MDD). Some of the catheters have been cleared by the US FDA for the Neuromonitoring application. However, in the USA most of the catheters in this advanced use section are considered investigational devices, and therefore are limited by US law to investigational use, only in Institutional Review Board (IRB)-approved or, if applicable, FDA-approved studies.

THE MICRODIALYSIS SYSTEM

Perfusion fluid flows from the Microdialysis Pump through the Microdialysis Catheter into a Microvial for collection. After the sampling period, the microvial is transferred to the Microdialysis Analyzer for the analysis. The results are then displayed on the screen.
CMA 60 Microdialysis Catheter
for microdialysis in subcutaneous adipose tissue and resting skeletal muscle.

THE sterile, single use CMA 60 MICRODIALYSIS CATHETER is designed for use in subcutaneous adipose tissue and resting skeletal muscle. The dialyzing membrane (30 mm in length) has excellent diffusion characteristics that permit high recoveries of small substances in the extracellular fluid. The catheter is pre-loaded into a unique slit cannula introducer that allows easy insertion into the tissue. The Luer-Lock fitting on the inlet tubing of the catheter is easily connected to the CMA 106 or the CMA 107 Microdialysis Pump. The outlet tubing ends in a needle fixed into a microvial holder and microvial, into which the sample is collected. The microvials can be changed and analyzed as desired.

This catheter is well suited for monitoring metabolic changes e.g. lipolysis, glycolysis, ischemia, hypoxia and cell damage in the tissue.

ORDERING INFORMATION

CMA 60 Microdialysis Catheter
4/pkg
CMA 60 Microdialysis Catheters
CMA 60 Microdialysis P000002

Accessories
For product information on Microvials, Microvial racks, Syringes and Perfusion Fluid, see pg 60-61.

Parts of the CMA 60 Microdialysis Catheter
1. Slit Introducer with CMA 60 Microdialysis Catheter loaded
2. Outlet tube
3. Vial holder
4. Microvial
5. Inlet tube
6. Luer-Lock connection
7. Puncture Needle

TECHNICAL INFORMATION

Membrane cut-off: 20 000 Daltons
Material | Length (mm) | Diameter (mm)
--- | --- | ---
Shaft | PUR** | 20 | 0.9
Membrane | PAES* | 30 | 0.6
Inlet tubing | PUR** | 400 | 1.0
Outlet tubing | PUR** | 105 | 1.0
Introducing Needle | Stainless Steel | 54 | 1.4

* polyarylethersulfone ** polyurethane

CAUTION: Investigational Device
Limited by United States Law to Investigational Use.
To be used only for Institutional Review Board (IRB) approved or, if applicable, FDA approved studies.

• Minimally invasive
• Biocompatible
• Pre-loaded into a slit cannula introducer
• Easy to insert into the tissue
THE sterile, single use CMA 61 HEPATIC MICRODIALYSIS CATHETER has a very long shaft to allow the continuous collection of tissue metabolites in the liver. The dialyzing membrane has excellent diffusion characteristics that allow a high recovery of substances from the extracellular fluid.

The CMA 61 Hepatic Microdialysis Catheter has a shaft length of 310 mm with a 30 mm PAES membrane. It is introduced into the abdominal cavity via a tunneling needle. Insertion into the liver is achieved with the help of a splitable introducer. After insertion, the catheter can be fixed with sutures.

For monitoring in hepatic tissue
Easy to insert into the tissue with the splitable introducer
Gold tip for location by CT Scan

TECHNICAL INFORMATION

Membrane cut-off: 20,000 Daltons

<table>
<thead>
<tr>
<th>Material</th>
<th>Length (mm)</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inner Shaft</td>
<td>310</td>
<td>0.9</td>
</tr>
<tr>
<td>Outer Shaft</td>
<td>280</td>
<td>1.5</td>
</tr>
<tr>
<td>Membrane</td>
<td>30</td>
<td>0.6</td>
</tr>
<tr>
<td>Inlet tubing</td>
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<tr>
<td>Outlet tubing</td>
<td>70</td>
<td>1.0</td>
</tr>
</tbody>
</table>

* polyarylethersulfone ** polyurethane
THE sterile, single use CMA 62 GASTROINTESTINAL MICRODIALYSIS CATHETER is a unique device. It allows the continuous monitoring and detection of local changes in metabolism in gastrointestinal research.

The CMA 62 Catheter has a shaft length of 180 mm with a 30 mm membrane. The catheter is introduced into the intraperitoneal cavity during open surgery.

The dialyzing membrane of this microdialysis catheter has excellent diffusion characteristics that allow a high recovery of substances from the intraperitoneal fluid.

---

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>CMA 62 Gastrointestinal Microdialysis Catheter</th>
<th>4/pkg</th>
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<tbody>
<tr>
<td>Ref. No.</td>
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**Accessories**

For product information on Microvials, Microvial racks, Syringes and Perfusion Fluid, see pg 60-61.

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**TECHNICAL INFORMATION**

**Membrane cut-off:** 20 000 Daltons

<table>
<thead>
<tr>
<th>Material</th>
<th>Length (mm)</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft</td>
<td>PUR**</td>
<td>180</td>
</tr>
<tr>
<td>Membrane</td>
<td>PAES*</td>
<td>30</td>
</tr>
<tr>
<td>Inlet tubing</td>
<td>PUR**</td>
<td>600</td>
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<tr>
<td>Outlet tubing</td>
<td>PUR**</td>
<td>220</td>
</tr>
</tbody>
</table>

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**Parts of the CMA 62 Gastrointestinal Microdialysis Catheter**

1. Dialysis membrane
2. Shaft
3. Liquid cross
4. Outlet tube
5. Vial holder
6. Microvial
7. Inlet tube
8. Luer-Lock connection
9. Fixating device (PEBAX®)

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**CAUTION: Investigational Device**

Limited by United States Law to Investigational Use.

To be used only for Institutional Review Board (IRB) approved or, if applicable, FDA approved studies.

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- High biocompatibility
- Designed to monitor metabolic changes
- Gold tip for location by CT scan
THE sterile, single use CMA 63 MICRODIALYSIS CATHETER is used for research in deep buried flaps, as well as in subcutaneous adipose tissue, resting skeletal muscle, and in hepatic tissue. It is available in 2 different membrane lengths and shaft lengths for the different applications. The catheter is easily introduced into the tissue with a splitable introducer which is included. The catheter is used together with the CMA pumps, syringes and microvials.

- Suitable for many applications
- Splitable Introducers are included
- Gold tip for location by CT scan
CMA 64 IView Microdialysis Catheter
for continuous blood monitoring

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>CMA 64 IView Microdialysis Catheter 4/pkg</th>
<th>Ref. No.</th>
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</thead>
<tbody>
<tr>
<td>CMA 64 IView Microdialysis Catheter 46/10, includes Introducer</td>
<td>8010520</td>
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<td>CMA 64 IView Microdialysis Catheter 46/20, includes Introducer</td>
<td>8010521</td>
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**Accessories**

For product information on Microvials, Microvial racks, Syringes and Perfusion Fluid, see pg 60-61.

**Parts of the CMA 64 IView Microdialysis Catheter**

1. Dialysis membrane
2. Shaft
3. Liquid cross
4. Outlet tube
5. Vial holder
6. Microvial
7. Inlet tube
8. Luer-Lock connection
9. Puncture needle
10. Introducer with Microdialysis Catheter

**TECHNICAL INFORMATION**

Membrane cut-off: 20 000 Daltons

<table>
<thead>
<tr>
<th>Material</th>
<th>Length (mm)</th>
<th>Diameter (mm)</th>
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<tbody>
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<tr>
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<td>200</td>
</tr>
<tr>
<td>Outlet tubing</td>
<td>45</td>
<td>45</td>
</tr>
</tbody>
</table>

* polarylethersulfone ** polyurethane

**THE CMA 64 IVIEW MICRODIALYSIS CATHETER** is a sterile, single use device intended for intravenous monitoring through a standard peripheral vein catheter (PVC) up to 72 hours. The clean samples and possibility for frequent sampling makes it ideal for research. Small substances diffuse into the IView catheter reflecting accurate concentrations in blood. It is perfused with a physiologic solution, containing the anticoagulant dalteparin sodium, to avoid clotting. The samples are collected in Microvials and can be analyzed as often as every minute. The catheter forms a complete system together with the CMA 107 Microdialysis Pump and the ISCUS Microdialysis Analyzer.

The catheter is also excellent for continuously monitoring the free fractions of drugs in blood during pharmacokinetic and pharmacodynamic studies.

- Continuous intravenous monitoring of substances in the blood for up to 3 days
- Easy insertion using a standard peripheral venous catheter
THE CMA 66 LINEAR MICRODIALYSIS CATHETER is a minimally invasive sterile single use device intended for Microdialysis monitoring in skin, adipose or resting skeletal muscle tissue. The catheter is available with either 20,000 or 100,000 Daltons cut off membrane. The CMA 66 is suitable for many research applications: metabolic research, estimating the free fraction of a drug, pharmacokinetic and pharmacodynamic studies or monitoring inflammatory processes in vivo.

Insertion into the tissue is easily done with the help of a small needle introducer. The unique patented linear design makes the catheter robust and safe to use for several days. When using the high cut off membrane we recommend perfusing the catheter with a fluid containing high molecular weight substances for fluid balance and to avoid ultra filtration (e.g. 30g Dextran 60/1000mL).

**ORDERING INFORMATION**

<table>
<thead>
<tr>
<th>CMA 66 Linear Microdialysis Catheter 4/pkg</th>
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<tbody>
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<td><strong>Ref. No.</strong></td>
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<td>CMA 66 Linear Catheter 30 mm, 20kD includes Needle introducer 8010650</td>
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<td>CMA 66 High Cut Off Linear Catheter 30 mm, 100kD includes Needle introducer 8010651</td>
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<tr>
<td>CMA 66 Linear Catheter 10 mm, 20kD Includes Needle introducer 8010670</td>
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<tr>
<td>CMA 66 High Cut Off Linear Catheter 10 mm, 100kD includes Needle introducer 8010671</td>
</tr>
</tbody>
</table>

**Accessories**

For product information on Perfusion Fluid and Syringes, see pg 60-61.

**Parts of the CMA 66 Linear Microdialysis Catheter**

1. Introducer needle 21 G, 50mm
2. Luer-Lock connection
3. Outlet tube
4. Dialysis membrane
5. Inlet tube

**TECHNICAL INFORMATION**

Membrane cut-off: 20 000 Daltons or High Cut Off membrane: 100 000 Daltons

<table>
<thead>
<tr>
<th>Material</th>
<th>Length (mm)</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Membrane</td>
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<td>Inlet tubing</td>
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</tr>
<tr>
<td>Outlet tubing</td>
<td>400</td>
<td>0.38</td>
</tr>
</tbody>
</table>

* polyarylethersulfone ** polyurethane

- Available with 20 000 or 100 000 Daltons cut-off
- Unique Linear Microdialysis Catheter for clinical use

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**CAUTION: Investigational Device Limited by United States Law to Investigational Use.**

To be used only for Institutional Review Board (IRB) approved or, if applicable, FDA approved studies.
THE sterile, single use CMA 70 BRAIN MICRODIALYSIS CATHETER is a highly flexible catheter designed for implantation in brain tissue to follow brain metabolism. A selection of this model of catheters is available with different membrane lengths and shaft lengths suitable for stereotaxic as well as manual implantation. When manually implanted in the brain, the CMA 70 Microdialysis Catheter can be tunneled under the scalp and then inserted into the brain tissue through a hole drilled in the skull bone (see page 56) with the help of non-crushing forceps. The tip of the CMA 70 Microdialysis Catheter has a gold thread, which makes it visible on a CT-scan to easily determine its position in vivo. This catheter is FDA-cleared for use in humans as part of the CMA Neuromonitoring System.

CMA 70 Brain Microdialysis Catheter
for use in brain tissue

ORDERING INFORMATION

CMA 70 Brain Microdialysis Catheter 4/pkg

Ref. No.
CMA 70 Brain Microdialysis Catheter 60/10 P000049
CMA 70 Brain Microdialysis Catheter 100/10 P000050
CMA 70 Brain Microdialysis Catheter 60/20 P000080

Accessories
Tunneling needle P000055
Forceps P000056
For product information on Microvials, Syringes and Perfusion Fluid, see page 60-61.

Parts of the CMA 70 Brain Microdialysis Catheter
1. Dialysis membrane
2. Shaft
3. Liquid cross
4. Stopper
5. Outlet tube
6. Vial holder
7. Microvial
8. Inlet tube
9. Luer-Lock connection

TECHNICAL INFORMATION

Membrane cut-off: 20 000 Daltons

<table>
<thead>
<tr>
<th>Material</th>
<th>Length (mm)</th>
<th>Diameter (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaft</td>
<td>PUR**</td>
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</tr>
<tr>
<td>Membrane</td>
<td>PAES*</td>
<td>10/10/20</td>
</tr>
<tr>
<td>Inlet tubing</td>
<td>PUR**</td>
<td>600/600/200</td>
</tr>
<tr>
<td>Outlet tubing</td>
<td>PUR**</td>
<td>220/220/220</td>
</tr>
</tbody>
</table>

* polyarylethesulfone ** polyurethane

• High biocompatibility
• Designed to monitor metabolic changes
• Gold tip for location by CT scan

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Catheters

CMA 70 Microdialysis Bolt Catheter
for use in brain tissue

THE sterile, single use CMA 70 MICRODIALYSIS BOLT CATHETER is designed for implantation in
brain tissue through an intracranial access device that has been fixed to the skull. The catheter’s Luer-
Lock fitting connects to one of the fittings on a port in an intracranial access device. The catheter’s steel
reinforcement prevents flow obstruction when the compression screw of the bolt is tightened. The shaft
length of the microdialysis catheter is 130 mm and the dialyzing membrane length is 10 mm. The CMA
70 Microdialysis Bolt Catheter is used together with the CMA 106/107 Microdialysis Pump, syringe
and microvials. For an updated list of coordinating intracranial access devices, please call CMA Microdi-
alysis. This catheter is FDA-cleared for use in humans as part of the CMA Neuromonitoring System.

ORDERING INFORMATION

CMA 70 Microdialysis
Bolt Catheter 4/pkg

Accessories

For product information on Microvials, Microvial racks,
Syringes and Perfusion Fluid, see pg 60-61.

TECHNICAL INFORMATION

Membrane cut-off: 20 000 Daltons

<table>
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<tr>
<th>Material</th>
<th>Length (mm)</th>
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<td>Membrane</td>
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<td>Inlet tubing</td>
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<tr>
<td>Outlet tubing</td>
<td>PUR**</td>
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</table>

* polyarylethersulfone ** polyurethane

• Implanted through a lumen in an intracranial access bolt
• Gold tip for location by CT scan
CMA 71 High Cut-Off Brain Microdialysis Catheter

allows sampling of large molecules

THE sterile, single use CMA 71 HIGH CUT-OFF BRAIN MICRODIALYSIS CATHETER is minimally invasive and designed for implantation in soft tissue either with the help of special forceps, or through a splitable introducer. The large pore size of this catheter allows diffusion of large molecules such as cytokines. The addition of large indiffusible molecules in the perfusion fluid is recommended to balance colloidal osmosis (e.g. 30g Dextran 60/100mL), and prevent ultrafiltration.

ORDERING INFORMATION

CMA 71 High Cut-Off Brain Microdialysis Catheter 4/pkg

Ref. No.

CMA 71 High Cut-Off Brain Microdialysis Catheter 60/10  8010320

CMA 71 High Cut-Off Brain Microdialysis Catheter 60/20  8010331

CMA 71 High Cut-Off Brain Microdialysis Catheter 60/30  8010337

Accessories

For product information on Microvials, Microvial racks, Syringes and Perfusion Fluid, see pg 60-61.

Parts of the CMA 71 High Cut-Off Brain Microdialysis Catheter

1. Dialysis membrane
2. Shaft
3. Liquid cross
4. Stopper
5. Outlet tube
6. Vial holder
7. Microvial
8. Inlet tube
9. Luer-Lock connection

TECHNICAL INFORMATION

Membrane cut-off: 100 000 Daltons

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* polyarylethersulfone  ** polyurethane

• Designed for use together with the portable CMA 106 and 107 Microdialysis Pump
• With gold tip, visible on CT  • Used to recover large molecules such as cytokines
CUSTOM MADE CATHETERS can be produced for the many advanced microdialysis applications. All custom catheter requests must be pre-approved prior to the acceptance of an order. The approval process includes an assessment of sterility validation based on the proposed specifications of the custom microdialysis catheter. Custom production can take 6-8 weeks from the approval.

ORDERING INFORMATION

Custom Made Catheters

Prior to the acceptance of an order for custom sterile catheters, the specifications must be submitted to CMA for Sterility Validation pre-approval.
CMA 60 Microdialysis Catheter

for microdialysis in subcutaneous adipose tissue and resting skeletal muscle


Note. Before implantation of the catheter into adipose tissue the membrane should be pre-wetted. See instructions for use.

1. Puncture the skin with the puncture needle.
2. Insert the introducer through the puncture hole.
3. Lift the wing straight up about 1-2 mm.
4. Pull out the introducer with one steady movement.
5. Lay the wing against the skin and secure with transparent surgical tape.
Implantation of catheters

CMA 61 Hepatic Microdialysis Catheter
for metabolic research in liver tissue


1. Introduce the tunnelating needle lateral to the rectus muscle, preferably in the linea semilunaris, from the inside of the abdominal wall going out through the skin.

2. Insert the catheter, with the protective tubing on, through the tip of the tunnelating needle.

3. Place a 6-0 resorbable suture in the falciform ligament

4. Insert the introducer in the middle of the falciform ligament, in direction to segment IV and VIII as close to the suture in the ligament as possible.

5. Unscrew the protective tubing on the catheter by turning it counterclockwise.

6. Remove the needle from the splitable Introducer. Carefully insert the catheter.

7. Grasp the tabs of the splitable tube (three hands needed) and pull the tabs apart, away from the indwelling catheter, until the tube splits down to its entire length.

8. Keep holding the catheter in place with the forceps. Tie the suture already placed in the falciform ligament to the suture of the catheter. Tie the catheter as tightly as possible to the ligament. Cut off the excess suture material.

9. Place the fixation device (white plastic wing) close to the insertion site and secure it to the catheter by suturing over the grooves/indentations.

10. Suture the fixation device to the skin through the two holes.

11. Put a protective bandage over the insertion site, e.g. Tegaderm®, OpSite® or similar.
Implantation of catheters

CMA 70 Brain Microdialysis Catheter

for microdialysis in brain tissue


1. Pass the catheter through the tunnelating tube.
2. Remove the protection tube by unscrewing it from the liquid cross.
3. Grip the catheter just proximal to the membrane with the microdialysis forceps. Pass it into the brain tissue through a hole made in the meninges.
4. Stretch the catheter and fix it firmly to the scalp by suturing around the stopper.
CMA 70 Microdialysis Bolt Catheter

for microdialysis in brain tissue


1. Insert the catheter in the microdialysis port.
2. The CMA 70 Microdialysis Bolt Catheter connected to the Intracranial Access Bolt Kit®.
3. Fix the catheter at the Luer Lock.
4. Tighten the compression screw.

1. The Intracranial Access Bolt Kit® fixed to the skull.

*Contact CMA for a list of approved devices.
CMA 106 Syringe Pump

a portable, fixed-flow, battery-operated pump

THE CMA 106 MICRODIALYSIS PUMP has been developed to function together with CMA Microdialysis Catheters. Portable and battery-driven, this small lightweight microprocessor-controlled syringe pump is very easy to use. The CMA 106 Syringe, filled with 2.5 mL of a sterile perfusion fluid and connected to a catheter, is placed in the carriage of the pump. When the lid is closed, the pump automatically starts a flush sequence (15 µL/min) for the first 5 minutes to fill the lines. Thereafter the flow rate decreases to 0.3 µL/min. Colored LEDs indicate function, enabling the user to easily oversee the operation.

TECHNICAL INFORMATION

Normal Flow rate: Fixed, 0.3 µL/min
Flush flow: 15 µL/min
Dimension: 90 x 50 x 20 mm
Weight: 70g (incl. Battery)
Battery: Lithium 6V
Casing: ABS plastic, splash proof
Operating temperature: +5 to +40ºC
Alarms: Error, Low battery

• Portable, small and lightweight
• Splash proof
• ETL-listed
• Easy to handle
• Self-controlled with LED function signals

ORDERING INFORMATION

CMA 106 Microdialysis Pump
Ref. No. P000003

CMA 106/107 Pump Syringe, 20/pkg 8010191
Batteries 2x3V, CMA 106,107 8001788
Perfusion Fluid, T1, 5 mL, 10/pkg P000034
Perfusion Fluid, CNS, 5 mL, 10/pkg P000151
THE CMA 107 MICRODIALYSIS PUMP is a unique 2.5 mL syringe pump with flexibility in flow rate that enables the user to change the flow for different purposes: low flow rate for high recovery of low molecular weight substances in a tissue, or high flow rate for blood flow measurements and for more frequent sampling intervals. The operating flow is adjustable to eight different settings: 0, 0.1, 0.2, 0.3, 0.5, 1.0, 2.0 and 5.0 µL/min by adjusting the dial on the pump.

The CMA 107 Microdialysis Pump is a portable battery-driven pump and very easy to use. The CMA syringe is filled with 2.5 mL of sterile perfusion fluid, connected to the microdialysis catheter and then placed in the pump. When the pump lid is closed, a 5-minute flush cycle begins and is followed by an automatic decrease to the pre-set operating rate.

Normal Flow: Variable, 0.1-5 µL/min, 8 settings
Flush flow: 15 µL/min
Dimension: 90 x 50 x 20 mm
Weight: 70g (incl. battery)
Battery: Lithium 6V
Casing: ABS plastic, splash proof
Operating temperature: +5 to +40°C
Alarms: Error, Low battery

- Portable, small and lightweight
- Splash proof
- ETL-listed
- Easy to handle
- Variable flow
- Self-controlled with LED function signals

ORDERING INFORMATION

CMA 107 Microdialysis Pump
Ref. No.
CMA 107 Microdialysis Pump  P000127

Accessories

CMA 106/107 Pump Syringe, 20/pkg  8010191
Batteries 2x3V, CMA 106,107  8001788
Perfusion Fluid, T1, 5 mL, 10/pkg  P000034
Perfusion Fluid, CNS, 5 mL, 10/pkg  P000151
MICROVIALS are designed to collect micro-volume samples and minimize evaporation. Each vial holds 200 µL. A Microvial rack is available for closing and storing 12 microvials and facilitating the logistics of sample handling. Sterile microvials are packaged in a rack for use under sterile conditions.

MICROVIAL RACKS. To minimize evaporation, samples in microvials can be placed in a Microvial Rack prior to storage in the refrigerator or freezer.
THE CMA 106 MICRODIALYSIS SYRINGE is specially designed for the CMA 106 and CMA 107 Microdialysis Pumps. The syringe holds 2.5mL of Perfusion Fluid.

PERFUSION FLUID is an isotonic sterile solution developed specifically for microdialysis probe and catheter perfusion. Perfusion Fluids are available for use in both the central nervous system (CNS) and peripheral tissue (T1). The fluid is conveniently packaged in glass ampoules, 5 mL each, sterile and ready to use.

ORDERING INFORMATION

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General Information

Customer Support
Internet Support
US Office and Distributors
Customer Support

Customer Support

Support and Technical Service

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

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service.usa@microdialysis.com

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Two-day intensive, introductory courses on Microdialysis are organized for those who are about to start or have just started using the technique.

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... Register for upcoming user meetings and workshops.
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Brazil | Germany | Norway | The Netherlands
Canada | Greece | Russia | Tunisia
China | Hungary | Singapore | Turkey
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