

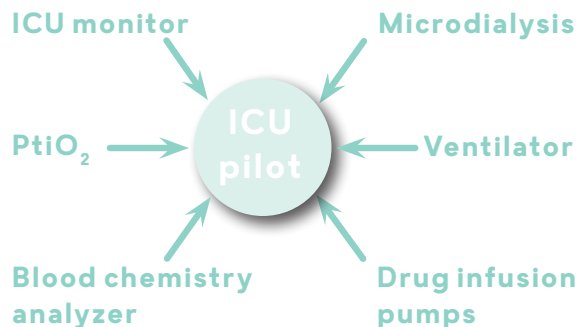
Consensus from expert panel & software for Multimodal Monitoring

The Consensus paper (Hutchinson et al. Intensive Care Med. 2015) from the International Microdialysis Forum meeting in Cambridge includes; experts guidance for use of microdialysis in traumatic brain injury and subarachnoid hemorrhage, catheter location, reference values and interventions. Find below a few conclusions from the paper:

- Low brain Glucose is associated with unfavorable outcome.
- An increase in the Lactate Pyruvate (LP) ratio in the presence of low Pyruvate (and low oxygen) indicates ischemia.
- An increase in the LP ratio in the presence of normal or high Pruvate (and normal oxygen) indicates mitochondrial dysfunction.
- A high LP ratio is associated with unfavorable outcome.

ICUpilot - software for multimodal monitoring

ICUpilot is a unique tool for multimodal monitoring in the ICU. Bedside Patient Monitors (showing e.g. blood pressure, pulse, ICP, CPP) as well as the Microdialysis Analyzer can be connected to a separate computer for on-line analysis and comparison of all data collected bedside during the entire care of the patient.



Literature:

Consensus statement from the 2014 International Microdialysis Forum. Hutchinson PJ et al. Intensive Care Med. 2015 Sep;41(9):1517-28.

Biochemical indications of cerebral ischaemia and mitochondrial dysfunction in severe brain trauma analysed with regard to type of lesion. Acta Neurochir (Wien). 2016 May 17. Nordström CH, Nielsen TH, Schalén W, Reinstrup P, Ungerstedt U.

Implementation of cerebral microdialysis at a community-based hospital: A 5-year retrospective analysis. Surg Neurol Int. 2012 Feb;134(Pt 2):484-94. Timofeev et al. Department of Neurosurgery, Legacy Emanuel Medical Center, Portland, USA.

Cerebral extracellular chemistry and outcome following traumatic brain injury: a microdialysis study of 223 patients. Brain. 2011 Feb;134(Pt 2):484-94. Timofeev et al. Division of Neurosurgery, Department of Clinical Neurosciences, University of Cambridge, Addenbrooke's Hospital, Cambridge, UK.

Delayed neurological deficits detected by an ischemic pattern in the extracellular cerebral metabolites in patients with aneurysmal subarachnoid hemorrhage. Journal of Neurosurgery 2004. Jane Skjoth-Rasmussen, Mette Schulz, Soren Risom Kristensen, Per Bjerre.

Cerebral Microdialysis Monitoring to Improve Individualized Neurointensive Care Therapy: An Update of Recent Clinical Data. Carteron L, Bouzat P, Oddo M, Front Neurol. 2017.

M Dialysis AB

M Dialysis AB is the leading company devoted to the development, manufacturing and marketing of the Microdialysis technique.

The head office is located in Stockholm, Sweden, with a subsidiary in Boston MA, USA. M Dialysis has distributors across the globe, responsible for local sales, service and support.

μ dialysis

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Distributor

Microdialysis

Advanced monitoring in neurointensive care

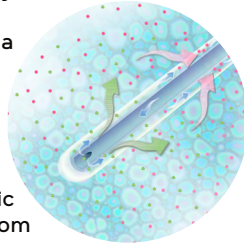
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Microdialysis in Neurointensive Care

Microdialysis is a tool for in vivo sampling of soft tissues that utilizes the principle of diffusion through a semi-permeable membrane. The technology is minimally-invasive, easy to handle, and may be used for several days.

The method is performed by inserting a Microdialysis catheter into the tissue being studied. The Microdialysis membrane of the catheter is in direct contact with the soft tissue.



The catheter is perfused with a isotonic solution. In the tissue, substances from the interstitial fluid diffuse through the semi-permeable membrane into the perfusion fluid. This fluid, now known as dialysate, flows through the outlet lumen and into a collection Microvial or directly in to a biosensor if connected to the MD System for real-time data of Glucose, Lactate and Pyruvate.

If the dialysate is collected in Microvials, analysis can be made in the ISCUS^{flex} Microdialysis Analyzer or in the laboratory.

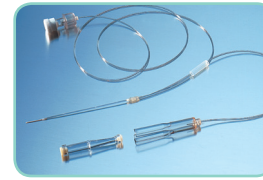
The microdialysis values provide a picture of the local tissue metabolism. This has been particularly useful in neurointensive care as there are well described metabolic changes that occur with secondary ischemic events in the cases of traumatic brain injury (TBI) and subarachnoid hemorrhage (SAH).

Secondary ischemia is a frequent and serious complication affecting patient outcome. Since Microdialysis allows continuous surveillance of cerebral metabolism in a clinical setting, secondary ischemia or mitochondrial dysfunction can be recognized at an early stage. Thus, the technique opens a window of opportunity for therapeutic interventions.

Brain Microdialysis Catheters & Continuous Microdialysis monitoring

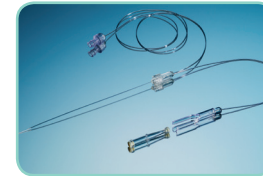
Microdialysis neuromonitoring is carried out by placing the sterile CE-certified Microdialysis catheter in the brain parenchyma. All Brain Microdialysis Catheters have a gold thread in the tip so confirmation of placement can be made by CT.

70 Brain/71 High Cut Off Microdialysis Catheter



- Free positioning and fixation by tunnelation
- 20 or 100 K Dalton cut off dialysis membrane
- Available in different lengths of shaft and membrane

70 Bolt/71 Bolt High Cut Off Microdialysis Catheter



- Access and fixation using a bolt system
- 20 or 100 K Dalton cut off dialysis membrane

MD System, LOKE for continuous monitoring

The unique continuous MD System is developed for routine microdialysis monitoring of patients in the Neurointensive care unit. Microdialysis values of Glucose and the ratio of Lactate and Pyruvate are displayed both numerically and graphically as trend curves for easy interpretation.

The MD system offers:

- Glucose, Lactate & Pyruvate continuously
- Automated plug and play system
- Easy to use for several days



The MD System is connected to the outlet of the Microdialysis Catheter and provides Microdialysis data in real-time, continuously, it is completely automated and can run for several days.

Microdialysis sampling & ISCUS^{flex} Microdialysis Analyzer

106 and 107 Microdialysis Pump

The 106 and 107 Microdialysis Pumps are dedicated for the perfusion of Microdialysis catheters with sterile isotonic Perfusion fluid CNS when collecting Microdialysis samples in Microvials. Both pumps are battery driven.

The 106 Microdialysis Pump operates at a fixed flow rate of 0.3 µl/min.

The flow rate of the 107 Microdialysis Pump can be set stepwise between 0.1 and 5.0 µl/min.



ISCUS^{flex} Microdialysis Analyzer

The ISCUS^{flex} Microdialysis Analyzer is specially designed to handle collected Microdialysis samples with low sample volumes. It is a point of care analyzer for monitoring of metabolic changes in tissues and organs during surgery, in intensive care and normal ward.

Biochemical markers:

- Glucose
- Lactate
- Pyruvate
- Glycerol
- Glutamate
- Urea



The ISCUS^{flex} Microdialysis Analyzer is easily operated by medical professionals and clinical researchers. It provides unique opportunities for early detection of metabolic crisis, ischemia and to guide post-operative interventions. Data is displayed as trend curves for easy and fast interpretation.